

**2016-2498, 2499**

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**United States Court of Appeals  
for the Federal Circuit**

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CHRISTY, INC.,

*Appellant,*

v.

BLACK & DECKER (U.S.), INC., STANLEY BLACK & DECKER, INC.,

*Appellees.*

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*Appeals from the United States Patent and Trademark Office,  
Patent Trial and Appeal Board, in Inter Partes Review  
Nos. IPR2015-00468 and IPR2015-00472*

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**BRIEF FOR APPELLANT CHRISTY, INC.**

FRANK J. CATALANO  
AMELIA A. FOGLEMAN  
PAUL E. ROSSLER  
ALICIA J. EDWARDS  
GABLEGOTWALS  
100 West 5th Street, Suite 1100  
Tulsa, Oklahoma 74103  
(918) 595-4800  
afogleman@gablelaw.com

*Counsel for Appellant  
Christy, Inc.*

**UNITED STATES COURT OF APPEALS FOR THE FEDERAL CIRCUIT**

Christy, Inc. v. Black & Decker (U.S.), Inc,  
Stanley Black & Decker, Inc.

Case No. 16-2498, 2499**CERTIFICATE OF INTEREST**

Counsel for the:

☐ (petitioner) ☒ (appellant) ☐ (respondent) ☐ (appellee) ☐ (amicus) ☐ (name of party)

CHRISTY, INC.

certifies the following (use "None" if applicable; use extra sheets if necessary):

1. Full Name of Party Represented by me	2. Name of Real Party in interest (Please only include any real party in interest NOT identified in Question 3) represented by me is:	3. Parent corporations and publicly held Companies that own 10 % or more of stock in the party
CHRISTY, INC.	Chris LaRue McCutchen	None
	Cristy Dawn Mirayala	

4. The names of all law firms and the partners or associates that appeared for the party or amicus now represented by me in the trial court or agency or are expected to appear in this court (**and who have not or will not enter an appearance in this case**) are:

Chad M. Hinrichs.

November 28, 2016

Date

/s/ Amelia A. Fogleman

Signature of counsel

Please Note: All questions must be answered

Amelia A. Fogleman

Printed name of counsel

cc:

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**STATEMENT OF RELATED CASES**

Pursuant to Fed. Cir. R. 47.5, counsel for Appellant Christy, Inc., states as follows:

(a) No other appeal in or from the same proceedings was previously before this or any other appellate court whether under the same or a similar title; and

(b) A related case, *CDC Larue Industries, Inc. and Christy, Inc. v. Black & Decker (U.S.) Inc.*, Case No. 14-CV-286-CVE-FHM, is pending in the United States District Court for the Northern District of Oklahoma. The Court's decision in this appeal will directly affect that case, in which Christy asserts claims against Black & Decker for infringement of U.S. Patent No. 7,082,640 (the "'640 Patent"), the patent at issue in this appeal.

## **JURISDICTIONAL STATEMENT**

This is an appeal from two Final Written Decisions of the Patent Trial and Appeal Board (the “Board”) of the United States Patent and Trademark Office entered on June 17, 2016 in *Inter Partes* Review Nos. IPR2015-00468 and IPR2015-00472 (the “Decisions”).

Christy timely filed notices of appeal on August 16, 2016. The Court has jurisdiction over this appeal under 28 U.S.C. § 1295(a)(4)(A) and 35 U.S.C. § 141.

## **STATEMENT OF THE ISSUES**

This appeal presents several issues related to the Board’s erroneous determination of unpatentability of claims of the ’640 Patent, including:

1. Did the Board err as a matter of law in shifting the burden of proof to Christy to prove that claims 1-18 of the ’640 Patent were not anticipated by prior art or obvious over prior art?
2. Did the Board err as a matter of law in adopting a construction of “canister”<sup>1</sup> that was not requested by the parties and was unsupported by any of the cited evidence?
3. Did the Board err as a matter of law in construing “pneumatic communication” in a manner that excluded from the ’640 Patent any requirement

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<sup>1</sup> The ’640 Patent uses the spelling “cannister.” Appx193, Abstr. The Board chose the more common spelling, “canister.” Appx4 n.4, Appx35 n.3. In this brief, Christy also uses “canister” except where quoting from material utilizing the alternate spelling.

for connective structure between the vacuum source, valves, and filters when claims 1 and 10 expressly require such connections and the specification and prosecution history confirm this requirement?

4. Did the Board err in concluding that Black & Decker had proven by a preponderance of the evidence that U.S. Patent No. 5,108,473 (“Hayden”) anticipates claims 1 and 10 of the ’640 Patent?

5. Did the Board err in concluding that Black & Decker had proven by a preponderance of the evidence that U.S. Patent No. 3,224,172 (“Eiben”) anticipates claims 1 and 10 of the ’640 Patent?

6. Did the Board err as a matter of law in construing the ’640 Patent such that it does not require a connection between the vacuum source, valves, and filters and, in view of that legal error, is the Board’s decision that claims 1 and 10 of the ’640 Patent are unpatentable, under 35 U.S.C. § 102, over Hayden erroneous?

7. Did the Board err as a matter of law in construing the ’640 Patent such that it does not require the valves to be in ambient air and, in view of that legal error, is the Board’s decision that claims 1 and 10 of the ’640 Patent are unpatentable, under 35 U.S.C. § 102, over Hayden erroneous?

8. In view of the Board’s erroneous construction of “canister” and in light of the Board’s correct construction of “ambient air,” is the Board’s decision

that claims 1 and 10 of the '640 Patent are unpatentable, under 35 U.S.C. § 102, over Hayden erroneous?

9. Did the Board err as a matter of law in construing the '640 Patent such that it does not require a connection between the vacuum source, valves, and filters and, in view of that legal error, is the Board's decision that claims 1 and 10 of the '640 Patent are unpatentable, under 35 U.S.C. § 102, over Eiben erroneous?

10. Did the Board err as a matter of law in construing the '640 Patent such that it does not require a one-to-one relationship between valves and filters, and in view of that legal error, is the Board's decision that claims 1 and 10 of the '640 Patent are unpatentable, under 35 U.S.C. § 102, over Eiben erroneous?

11. In view of the Board's erroneous construction of "canister," is the Board's decision that claims 1 and 10 of the '640 Patent are unpatentable, under 35 U.S.C. § 102, over Eiben erroneous?

12. Did the Board err as a matter of law in concluding that claims 1-18 of the '640 Patent are unpatentable, under 35 U.S.C. § 103, as obvious over the references cited by Black & Decker?

## **STATEMENT OF THE CASE**

### **I. History Of The '640 Patent.**

In July 2003, Christy, Inc.<sup>2</sup> filed a patent application for an “Ambient Air Backflushed Filter Vacuum.” Appx523. The Examiner twice rejected Christy’s application as unpatentable based on prior art (*i.e.*, first Nelson, then Finigan). Appx245, Appx275. Both times, Christy successfully distinguished the prior art from its invention, Appx262-263, and, after unilaterally acknowledging allowability over Hayden, the Examiner ultimately allowed the patent, Appx217.

In September 2003, Christy began selling the PULSE-BAC vacuum based on the technology in the '640 Patent. Appx523. On August 1, 2006, the '640 Patent issued. Appx193. In 2008, Black & Decker’s predecessor approached Christy about obtaining a license for the '640 Patent and indicated its intent for Christy to produce a line of vacuum cleaners under Black & Decker’s DeWalt label that would utilize the PULSE-BAC technology. Appx523, Appx526-537. Pursuant to a confidentiality agreement, Appx526-527, the companies shared information regarding the PULSE-BAC technology, Appx524.

In late 2010, Black & Decker purchased two PULSE-BAC vacuums and ceased further communications with Christy. Appx524. In 2012, Black & Decker

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<sup>2</sup> The patent application was filed by David McCutchen, whose family owns Christy. Christy is the assignee of the '640 Patent. For purposes of convenience and to avoid confusion, this brief refers to Christy as the inventor and patent owner.

released its DWV012 vacuum. Appx524. In 2014, Christy filed suit in the United States District Court for the Northern District of Oklahoma, alleging Black & Decker has infringed on the '640 Patent through its DWV012 vacuum. Appx540. Following a *Markman* hearing, the Oklahoma court issued an Opinion and Order interpreting two terms in the '640 Patent: “ambient air” and “drawn.” Appx538. That case has been administratively closed pending the outcome of this appeal.

## **II. The IPR Proceeding**

On December 19, 2014, Black & Decker filed two Petitions for *Inter Partes* Review (“IPR”) in the United States Patent and Trademark Office (“PTO”), challenging the validity of 18 of the 20 claims in the '640 Patent. Appx124, Appx747. The petitions primarily asserted that the '640 Patent’s independent claims (*i.e.*, claims 1 and 10) were anticipated by Hayden (Appx154) and Eiben (Appx776). Christy filed a Preliminary Response to both petitions. Appx494, Appx1099. The Board granted the Petition regarding Hayden and instituted trial on five of the fourteen grounds asserted by Black & Decker in that Petition.<sup>3</sup>

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<sup>3</sup> The Board instituted trial on the following grounds:

- (1) Claims 1 and 10 as anticipated by Hayden;
  - (2) Claims 1, 4-6, 10, and 13-15 as obvious over Hayden and Wellan;
  - (3) Claims 7-9 and 16-18 as obvious over Hayden, DE219, and Howeth;
  - (4) Claims 9 and 18 as obvious over Hayden, DE219, Howeth, and Wellan;
- and
- (5) Claims 2, 3, 11, and 12 as obvious over Hayden and von Stackelberg.
- Appx96.

Appx555. The Board also granted the Petition based on Eiben, instituting trial on four of the seven grounds asserted in that Petition.<sup>4</sup> Appx1156.

### **III. The '640 Patent Claims**

#### **A. The Claim Language.**

The words of the claims themselves are always the starting point of claim construction. Claim 1 of the '640 Patent recites a vacuum cleaning machine comprising:

- a canister having an inlet port and at least two outlet ports,
- at least two filters disposed inside of said canister, one in pneumatic communication through a corresponding one of each of said outlet ports,
- a vacuum source,
- at least two valves disposed outside of said canister,
- each said valve

being in pneumatic communication between said vacuum source and a corresponding one of each of said outlet ports and

permitting air to be drawn by said vacuum source from said inlet port simultaneously through corresponding ones of said filters and

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<sup>4</sup> The Board instituted trial on the following grounds:

- (1) Claims 1 and 10 as anticipated by Eiben;
- (2) Claims 1, 4-6, 10, and 13-15 as obvious over Eiben and Wellan;
- (3) Claims 7-9 and 16-18 as obvious over Eiben, DE219, and Howeth; and
- (4) Claims 9 and 18 as obvious over Eiben, DE219, Howeth, and Wellan.

Appx1174-1175.

- means for sequentially operating said valves

to switch said filters from connection to said vacuum source to connection to ambient air and

permitting ambient air to be drawn through corresponding ones of said valves and said filters which are connected to ambient air by said vacuum via corresponding ones of said valves and filters which are connected to said vacuum.

Appx203. Claim 10 is essentially the same as claim 1, except claim 10 specifically requires three outlet ports, three filters, and three valves. Appx203-204.

## **B. The Specification**

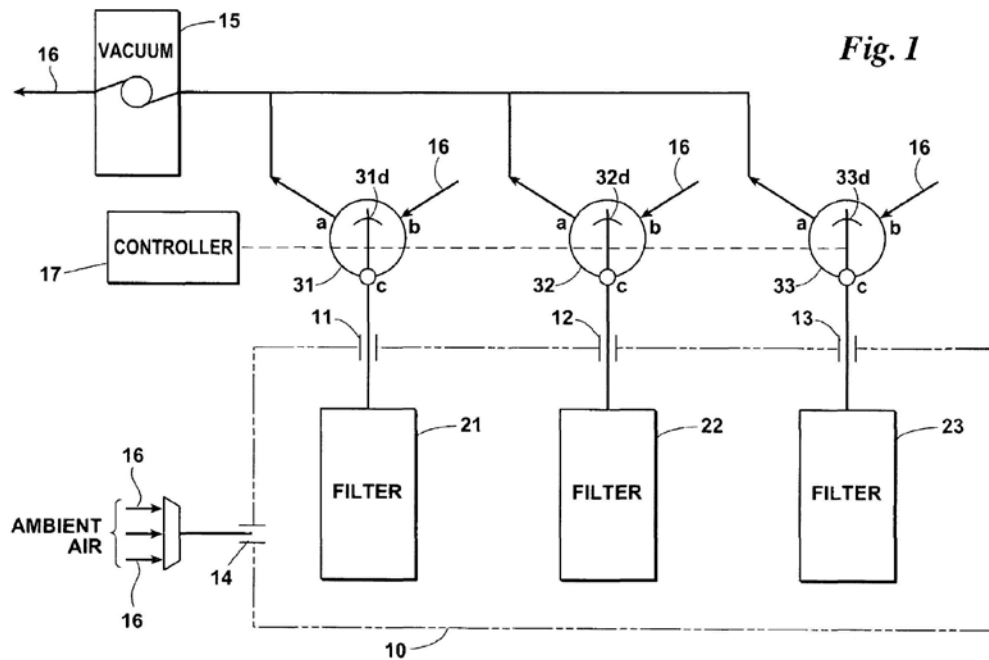
Claims 1 and 10 recite a structure consistent with the preferred embodiment illustrated in the '640 Patent. The '640 Patent discloses multiple sets of filters and valves designed to permit the filters to be sequentially backflushed while the machine is in use. Figure 1 illustrates the preferred embodiment of the claimed arrangement of the vacuum source (15), three valves (31, 32, 33), and three connected filters (21, 22, 23). Appx194. The filters are disposed inside the canister (10), which has three outlet ports (11, 12, 13) and an inlet port (14). Each of the outlet ports connects a filter to a corresponding valve.<sup>5</sup> The valves are disposed outside of the canister in ambient air. Appx201, 3:31-32. The valves can be switched from connection to the vacuum source or to ambient air depending on

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<sup>5</sup> The specification describes the relationship as follows: "Each of the valves . . . has a continuously opened port 31c, 32c or 33c which is in constant communication through a *respective* outlet port 11, 12 or 13 with a *respective* filter 21, 22 or 23." Appx201, 3:33-35 (emphasis added).



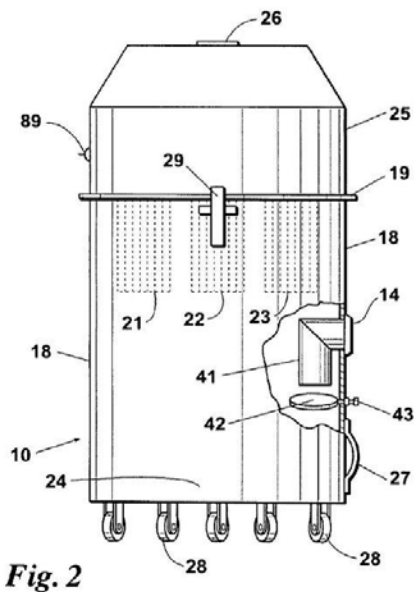
whether the corresponding filter is in vacuum or backflush operation. Appx201, 3:36-44, 3:54-57.



Each of the valves (31, 32, and 33) is a three-way valve, meaning it has three ports, one of which (the “c” port) is always connected to its corresponding filter. Appx201, 3:32-38. The other two ports (the “a” and “b” ports) can switch between open and closed. Appx201, 3:36-38. The “a” port (31a, 32a, and 33a) is “connected to a vacuum source.” Appx201, 3:41-42. The “b” port (31b, 32b, and 33b) is in “pneumatic communication” with a source of ambient air (16), which causes the filter to be backflushed. Appx201, 3:42-44, 3:54-55. This arrangement allows each valve/filter combination to operate in either vacuum or backflush mode depending on which port is open. A controller (17) controls the opening and

closing of the “a” and “b” ports and causes the valves to switch between vacuum and backflush modes in sequential order. Appx201, 3:52-54.

Figure 2 shows a side elevation view of the vacuum, illustrating the structural configuration of the canister. Appx195, Appx201, 4:22-27. The valves and vacuum source, both shown in Figure 1 as residing outside of the canister in ambient air, are hidden by a cover (25) which sits on top of the canister. An outlet opening (26) of the cover “exhaust[s] air discharged from the vacuum source.” Appx201, 4:22-27.



A handle (27) at the bottom of the canister (10) can be used “to facilitate lifting and handling of the unit,” and casters (28) at the bottom (24) of the canister allow it to be “freely rolled in any direction.” Appx201, 4:27-31.

### C. The Prosecution History

During the patent prosecution, the Examiner cited Nelson as a prior art reference. Appx275. In response, Christy noted that “Nelson does not teach Applicant’s *claimed connection of components*.” Appx263, Appx881 (emphasis added). To demonstrate this difference over Nelson, Christy annotated the ’640 Patent’s Figure 1 and noted that in this embodiment, the vacuum source “is *directly connected by the duct work* through the valves 31, 32 and 33 to their filters 21, 22 or 23 in the canister 10 in three discrete defined pneumatic paths.” Appx263 (emphasis added). Christy then discussed what happens when one of the valves (for example, valve 31) is switched to ambient air. In that case, “the vacuum 15 is *directly connected* to the valves 32 and 33 and therefore to the filters 22 and 23 . . . .” Appx263 (emphasis added), *see* Appx266-267.

In his Reasons for Allowance regarding the ’640 Patent, the Examiner identified Hayden as the “closest prior art” but noted key distinctions between Hayden and Christy’s claimed invention. Appx221. Primarily, he recognized that Christy placed its valves outside the canister and required the canister have at least two outlet ports. Appx221. By contrast, Hayden “has the valves located inside the canister and the canister has only a single outlet.” Appx221.

The Examiner also noted that because Hayden's valves are inside the canister, "to get sufficient backflush airflow," Hayden had to "overcome head (pressure) losses in the duct." Appx221. He recognized:

Even if another prior art reference had the structure recited above and Hayden could be used to demonstrate either forced air cleaning or ambient air cleaning (which it doesn't), it would not have been obvious to modify [Hayden] to have the valves connected to ambient air, *as it would require significant modification to the prior art and destroy the prior art device as disclosed* (forced air filter cleaning only).

Appx221-222 (emphasis added).

#### **IV. Prior Interpretations Of Claim Terms**

In the Oklahoma case, the district court defined "ambient air" to mean the "air surrounding the cannister." Appx551. It concluded that "drawn" meant "pulled or sucked by the vacuum only." Appx553.

In the institution decisions, the Board construed a number of terms at Black & Decker's request. Appx555, Appx1156. With respect to eight terms, the Board adopted constructions of those terms that were not disputed by the parties. Appx563-564, Appx1164-1165. The Board also adopted the Oklahoma court's construction of "ambient air" to mean "air surrounding the canister." Appx562, Appx1162-1163. Finally, the Board interpreted "drawn" to mean "pulled in by negative pressure." Appx563, Appx1163. The Board did not construe any

additional terms, nor did it request arguments from the parties as to the construction of additional terms. Appx555, Appx1156.

After Christy submitted responses to the institution decisions, Appx578, Appx1177, and Black & Decker filed its reply briefs, Appx626, Appx1220, the Board held an oral hearing on March 22, 2016. Appx695, Appx1262. At the hearing, the Board—for the first time—questioned whether the term “canister” had been construed in the district court litigation or otherwise. Appx709, 15:1-10. Counsel for Black & Decker correctly informed the Board that no such construction had occurred. *Id.* Counsel for Black & Decker also argued extensively regarding the meaning of the term “pneumatic communication” in claims 1 and 10. Appx703-708. The Board then asked counsel for Christy questions regarding the term but did not express an intent to construe the term. Appx723-726.

The Board entered its Decisions on June 17, 2016. Appx1, Appx32. Although the Board had not previously construed the terms “pneumatic communication” and “canister” and noted that neither party had requested construction of those terms, the Board construed the terms in its Decisions. Appx10, Appx12-14, Appx43-45. It construed “canister” to mean a “container.” Appx13, Appx44. It also construed “pneumatic communication” as “not limited to

a ‘duct.’” Appx14, Appx45. Based in part on its interpretation of those terms, the Board held claims 1-18 of the ’640 Patent to be unpatentable. Appx30, Appx58.

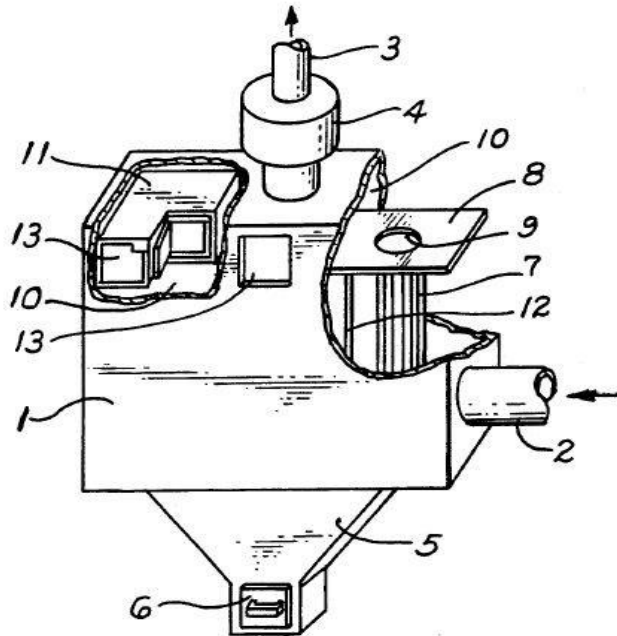
## **V. The Prior Art**

The Board noted that for purposes of its Decisions, it considered the “cited prior art,” which primarily included Hayden and Eiben, to be “representative of the level of ordinary skill in the art.” Appx8, Appx38. Hayden and Eiben disclose machines in which atmospheric or ambient air surrounds the structure and is present at the dirty air inlet and the vacuum source exhaust. Between the inlet and the vacuum source, the air is below atmospheric pressure and flows to the vacuum source. The structure between the inlet and the vacuum source determines the paths of pneumatic communication between the components.

### **A. Hayden**

Hayden describes a dust collector that filters dirty air and periodically backflushes its filters by using the dust collector exit blower to suck ambient air backwards through the filtration element. Appx330, Abstr. Diverter valves are used to switch the device between normal usage and backflush mode. Appx330, Abstr. Hayden recognizes that the cabinet of a dust collector is “kept below atmospheric pressure.” Appx333, 2:28-29. Hayden’s cabinet is divided into a “dirty air chamber” and a “clean air chamber.” Appx334, 3:34-38. Figure 1 is a

perspective view of the dust collector with the cabinet cut away. Appx331, Appx333, 2:64-65.



**Fig. 1**

A divider plate (8) separates the dirty air chamber and the clean air chamber. Appx334, 3:35-38. The filters (7) are disposed inside the dirty air chamber (not numbered). Appx334, 3:43-45. Each filter has an outlet hole (9) in the divider plate (8). Appx334, 3:43-45. Above each outlet hole (9) is a diverter valve (11), which rests on top of the divider plate (8).<sup>6</sup> Appx334:40-41.

The tops and sides of the valves (11) are surrounded by open space inside the clean air chamber (10). Appx334, 3:38-40. The suction blower (4) is

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<sup>6</sup> The Examiner recognized that Hayden differed from the '640 Patent because Hayden "has the valves located *inside* the canister and the canister has only a *single* outlet." Appx221, Appx839 (emphasis added). The Examiner clearly—and correctly—viewed Hayden's canister to include the clean air chamber.

connected to the top of the clean air chamber (10) and sucks dirty air from the inlet (2), causing air flow through the filters (7) which collect the dirt from the air. Appx334, 3:55-57. The clean air then exits the device through the clean air exhaust (3). Appx334, 3:33-34.

In backflush mode, the diverter valve (11) switches to connect one of the filters (7) to ambient air through its air inlet port (13) extending from outside the clean air chamber (10) to the valve (11). Appx333, 2:28-41, Appx334, 3:43-55. This confirms Hayden knew that ambient air is not available inside the cabinet. Thus, he must transport ambient air from *outside* the cabinet to the valves inside the clean air chamber of the cabinet. Appx334, 3:45-55. For large machines with a “dozen or so filters,” Hayden notes that his machine can provide “atmospheric air”<sup>7</sup> to the valves “through a manifold located within [the] clean-air chamber.” Appx334, 3:45-48. Smaller machines can utilize “air inlet ports” to transfer ambient air from *outside of the dust collector* to the valves. Appx334, 3:49-55; *see* Appx335, 5:38-41 (describing “duct conveying atmospheric air to one of said valve seats”). Both means evidence the need to import ambient air into the clean air chamber because it cannot be found there otherwise.

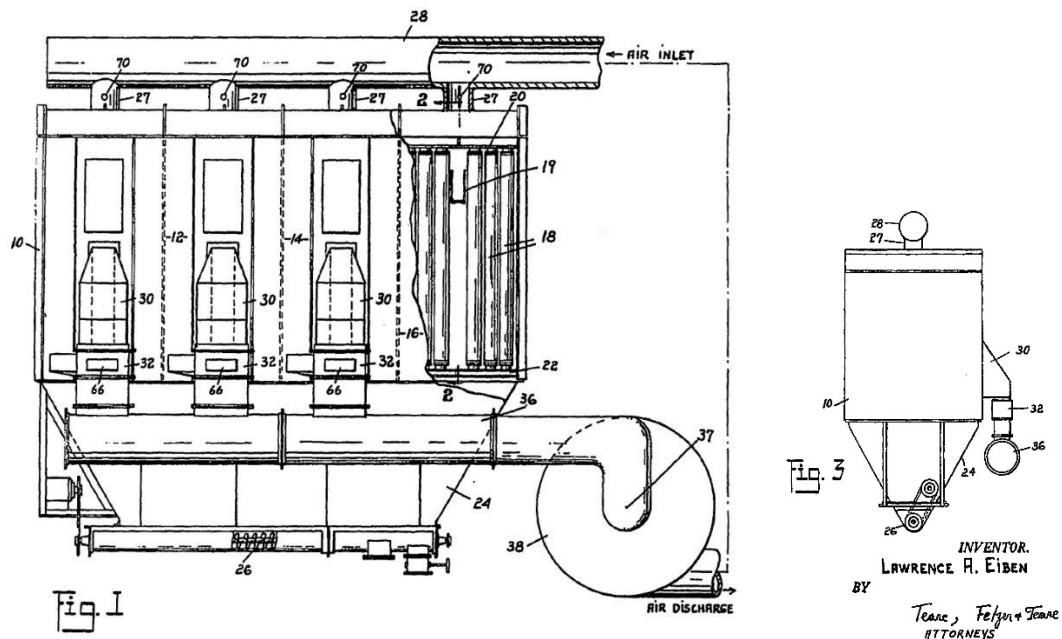
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<sup>7</sup> Although Hayden uses the term “atmospheric air” to backflush his machine instead of the “ambient air” used to backflush the filters in the ’640 Patent, these terms are interchangeable in this context. If they were mutually exclusive, then this fact, in itself, would be sufficient to differentiate the inventions.



## B. Eiben

Eiben describes what is typically called a “bag house,” which includes a number of “collecting units” or “compartments.” Appx953, 1:13-15, Appx953, 2:43-44. Each compartment contains its own set of “elongated, fabric filter bags.” Appx953, 1:13-15. Figure 1 is a partially broken, side elevational view of Eiben’s bag house. Appx953, 2:10-12. Figure 3 is a side view taken from a left-hand end of Figure 1. Appx953, 2:16-17.



Appx948. Figure 1 shows a bag house with four filtering compartments (10, 12, 14, and 16) mounted together upon a hopper (24). Appx953, 2:42-54. A number of filter bags (18) are vertically oriented within each compartment. Appx953, 2:44-45. The upper third of each compartment contains its own “elongated

walkway” for bag house workers (19) extending between the walls of the compartment. Appx953, 2:45-48.

The filter bags (18) are open at both ends and connected at the top to one plate (20) and at the bottom to another plate (22). Appx953, 2:48-52. An air inlet duct (28) runs across the top of the compartments, transmitting the dust laden air to the air ducts (27) to the individual compartments. Appx953, 2:56-59. During normal operation, the blower (38) sucks the dirty air through the filter bags’ walls, trapping the dust on the interior of the bags. Appx954, 4:26-32. The cleaned air then passes through the exhaust ducts (30) of each compartment, Appx954, 4:32-33, and through a “damper or butterfly valve mechanism” (32) to a common clean air pipe (36) running under all of the compartments, Appx953, 2:60-66. The clean air pipe (36) is connected to the suction side of the fan or blower (38). Appx953, 2:66-67.

To clean the filter bags in a particular compartment (10, 12, 14, *or* 16), the valve (32) to that compartment is switched, closing the connection to the clean air pipe and opening a door leading to ambient air. Appx954, 4:35-43. The filter bags in the “closed” compartment then collapse, loosening the dust on the inner surface of the bags on impact so that it falls off easily when the bags are reinflated by normal flow. Appx954, 4:50-56.

### **SUMMARY OF THE ARGUMENT**

The '640 Patent and the primary references cited against it, *i.e.*, Hayden and Eiben, all disclose machines used to remove dust or dirt from the air. All of these machines have an inlet or inlets through which the dirty air enters the machine, and an outlet by which the clean air exits. They have filters, which remove particles from the dirty air as it passes. They each use a suction blower at the clean-air outlet to cause airflow through the machine from the dirty-air inlet to the clean-air outlet. And they use valves to reverse the direction of the air flow. But key differences exist between the three machines, including but not limited to the placement of the valves and the paths of pneumatic communication. These differences, as well as others discussed below, establish that the '640 Patent was not anticipated by Hayden or Eiben and require reversal of the Board's Decisions invalidating Claims 1-18 of the '640 Patent.

The '640 Patent requires the valves of its vacuum cleaner to be outside of the canister and in ambient air. In its Decisions, the Board accepts this fact but fails to recognize the importance of it. By placing the valves outside of the canister and in ambient air, the '640 Patent provides the valves with ready access to the ambient air used to backflush the filters. Because the vacuum source is also outside of the canister in ambient air, there must be a connection between the valves and vacuum source for pneumatic communication to occur. Without this

connection, all the vacuum source would do is suck in nearby dirty air and release it. Even little children know that to get juice through a straw, one end of the straw must be inserted into the juice. If the bottom of the straw is in the air, then only air—not juice—gets sucked through the straw. Similarly, the vacuum source in the claim could not draw air through the valves and filters unless it is in connection with the valves also located in ambient air.

Hayden's valves are not in ambient air but instead are disposed in the clean air chamber, which is below atmospheric pressure. Because of this arrangement, Hayden does not need any connection with the vacuum source to place the valves in pneumatic communication with the vacuum source. And Hayden has no such connection. The vacuum source sits on top of, and is connected to, the clean air chamber. Therefore, the valves inside the clean air chamber are internally and externally subjected to the suction provided by the vacuum source on the chamber as a whole. But to get ambient air to each valve Hayden is forced to import the ambient air located outside of the cabinet through a manifold or port in connection with the valve. Without this manifold or port, there is no pneumatic communication between the valve and ambient air.

Eiben has a different problem than that of either the '640 Patent or Hayden and, therefore, discloses a different pneumatic communication arrangement and air flow pattern. Eiben's bag house filters must be inflated when vacuuming but

collapsed during reverse airflow. Eiben thus connects the valve to the outside of the compartment containing the bag filters. Unlike the '640 Patent or Hayden, Eiben cannot connect the always-open port of the valve to the filter because the bag filters would then remain inflated regardless of the direction of air flow.

The Board apparently failed to understand these basic principles of air flow. Completely ignoring the “corresponding” and “connection” language, and construing “pneumatic communication”—a term no party asked it to construe, the Board held that the '640 Patent does not require any connective structure between the vacuum source, valves, and filters. This construction is contrary to the clear language of the claims, the specification, the prosecution history, and common sense. Put simply, without connective structure, Christy’s vacuum cleaner would not work. The additional claim term “connection to,” which is used twice in both claims 1 and 10, confirms the requirement for a connection from vacuum source to valves and from valves to filters and to ambient air surrounding the valves. The Board’s erroneous construction of the claims, and its anticipation and obviousness decisions based on that construction, should be reversed.

Finally, the Board demonstrated a fundamental misunderstanding of the burden of proof in these *inter partes* reviews. Although giving lip service to the principle that Black & Decker, as the petitioner, has the burden to prove the patent’s invalidity, the Board repeatedly—and sometimes with no explanation—

deemed Christy's arguments "unpersuasive." This strongly indicates that the Board improperly shifted the burden of persuasion to Christy, contrary to the clear precedent of this Court.

## **ARGUMENT**

### **I. Standards Of Review.**

The ultimate construction of a claim is a legal question that this Court reviews de novo. *SAS Institute, Inc. v. ComplementSoft, LLC*, 825 F.3d 1341, 1347 (Fed. Cir. 2016). If, as in this case, the claim can be construed "based solely upon intrinsic evidence—meaning the patent claims, the patent specification, and the prosecution history," that construction is a matter of law reviewed de novo. *Id.*; see *Microsoft Corp. v. Proxyconn*, 789 F.3d 1292, 1297 (Fed. Cir. 2015) (applying de novo review where the intrinsic record fully determined proper construction of the claim and declining to consider the Board's findings regarding extrinsic evidence because the intrinsic record was clear).

Anticipation and prior art teachings present questions of fact. *In re NTP, Inc.*, 654 F.3d 1279, 1297 (Fed. Cir. 2011). This Court reviews the Board's factual findings for substantial evidence. *In re Gleave*, 560 F.3d 1331, 1335 (Fed. Cir. 2009). The determination of obviousness under 35 U.S.C. § 103(a) is a legal conclusion based on underlying findings of fact. *In re Mettke*, 570 F.3d 1356,

1358 (Fed. Cir. 2009). The Board’s ultimate determination of obviousness is reviewed de novo. *In re Kotzab*, 217 F.3d 1365, 1369 (Fed. Cir. 2000).

## **II. The Board Improperly Shifted The Burden Of Proof To Christy.**

This Court recently has recognized that the “burden of proof is on the petitioner to prove unpatentable those issued claims that were actually challenged in the petition for review and for which the Board instituted review.” *In re Magnum Oil Tools Int’l, Ltd.*, 829 F.3d 1364, 1375 (Fed. Cir. 2016) (quoting *Nike, Inc. v. Adidas AG*, 812 F.3d 1326, 1334 (Fed. Cir. 2016)). The burden of proof includes the burden of persuasion. *Id.* Although the Board correctly recited that Black & Decker has the burden of proof in these proceedings, Appx3, Appx34, it stated no fewer than *eight* times in the two Decisions that *Christy* had failed to persuade the Board on an argument relating to the validity of Christy’s patent claims. The Board stated:

- “[Christy] concludes that because the canister depicted in the ’640 patent as item 10 and 19 has a single chamber, ‘Hayden’s two chamber canister and [Christy’s] single chamber canister 10, 19 do not correspond.’ *We are not persuaded.*” Appx19 (emphasis added) (citation omitted).
- “[Christy] contends that ‘[Christy’s] vacuum source 15 is connected to each valve 31, 32, 33, not to a negative pressure chamber 10’ while ‘Hayden’s clean air chamber 10 is a negative pressure chamber common to and encasing all of the “outlet” ports 9 and valves 11.’ *[Christy’s] arguments are unpersuasive . . .*” Appx20 (emphasis added) (citation omitted).

- “*We are not persuaded by [Christy’s] arguments* because neither the ’640 patent claims nor the teachings of Hayden preclude reading the term ‘canister,’ as construed herein, on Hayden’s ‘dirty air chamber below plate 8 in which the filters 7 are located.’” Appx20 (emphasis added) (citation omitted).
- “*We are unpersuaded by [Christy]* that Hayden does not disclose the claimed ‘cannister,’ the claimed ‘valves disposed out of said cannister,’ and the claimed ‘connection to ambient air’ recited in claims 1 and 10.” Appx21 (emphasis added).
- “[W]e do not find persuasive [Christy’s] attorney arguments presented as diagrams in Exhibits 2005 and 2006.” Appx23 (emphasis added).
- “We are unpersuaded by [Christy’s] arguments . . . .” Appx29.
- “*We find [Christy’s] arguments unpersuasive* because the ’640 patent claims are sufficiently broad so as to encompass the distinctions drawn between the figures in the ’640 patent and Eiben.” Appx50 (emphasis added).
- “[W]e determine that [Christy’s] assertions are unpersuasive because the field of the claimed invention relates generally to ‘vacuum cleaning equipment,’ which we find is in the same field as Eiben’s ‘devices known as dust collectors’ . . . .” Appx57 (emphasis added) (citation omitted).

The Board repeatedly—and wrongly—indicated that Christy bore the burden of persuading the Board as to the validity of its claims. *See Magnum Tools*, 829 F.3d at 1377-78 (Fed. Cir. 2016) (reversing Board’s decision invalidating patent in IPR proceeding where the final written decision was “replete with examples” where “the Board improperly shifted the burden to [the patent owner] to disprove



obviousness.”). The Court should reverse the Board’s Decisions for failure to apply the correct standard of proof and improperly shifting the burden of persuasion to Christy.

### **III. The Board Erred In Its Construction Of The Claims.**

#### **A. Claims Should Be Construed Consistently With The Specification And Prosecution History.**

“Claim construction seeks to ascribe the meaning to claim terms as a person of ordinary skill in the art at the time of the invention would have understood them.” *SAS Institute*, 825 F.3d at 1347. In *Phillips v. AWH Corporation*, 415 F.3d 1303 (Fed. Cir. 2005) (en banc), the Court reaffirmed that “[i]t is a ‘bedrock principle’ of patent law that the ‘claims define the invention . . . .’” *Id.* at 1312 (citation omitted). Thus, the words of the claims themselves are always the starting point of claim construction.

But the words of the claims are not the end of the inquiry. This Court has made clear that in IPR proceedings, the Board must give claims their “broadest reasonable interpretation *consistent with the specification*.” *PPC Broadband, Inc. v. Corning Optical Commc’ns RF, LLC*, 815 F.3d 734, 740 (Fed. Cir. 2016) (emphasis added); see *Proxyconn*, 789 F.3d at 1298 (“‘[C]laims should always be read in light of the specification and teachings in the underlying patent.’” (quoting *In re Suitco Surface, Inc.*, 603 F.3d 1255, 1260 (Fed. Cir. 2010))). The Board acknowledged that under the broadest reasonable interpretation standard, “claim

terms are given their ordinary and customary meaning, as would be understood by one of ordinary skill in the art *in the context of the entire disclosure.*” Appx8, Appx39 (emphasis added).

This Court has cautioned that the “broadest *reasonable* interpretation” standard does not call for the “broadest *possible* interpretation” of a claim. *See SAS Institute*, 825 F.3d at 1348 (“While we have endorsed the Board’s use of the broadest reasonable interpretation standard in IPR proceedings, we also take care not to read ‘reasonable’ out of the standard.”); *Proxyconn*, 789 F.3d at 1298 (noting the standard does not permit the Board to “construe claims during IPR so broadly that its constructions are *unreasonable* under general claim construction principles” or produce interpretations that are “‘legally incorrect’”) (citation omitted); *In re Suitco*, 603 F.3d at 1260 (“The broadest-construction rubric . . . does not give PTO an unfettered license to interpret claims to embrace anything remotely related to the claimed invention.”).

Even under the broadest reasonable interpretation, the Board’s construction “cannot be divorced from the specification and the record evidence,” and “must be consistent with one that those skilled in the art would reach.” A construction that is “unreasonably broad” and which does not “reasonably reflect the plain language and disclosure” will not pass muster.

*Proxyconn*, 789 F.3d at 1298 (internal citations omitted); *see Trivascular, Inc. v. Samuels*, 812 F.3d 1056, 1062 (Fed. Cir. 2016) (“Construing individual words of a

claim without considering the context in which those words appear is simply not ‘reasonable.’”).

Citing *In re Van Geuns*, 988 F.2d 1181 (Fed. Cir. 1993) and *In re Self*, 671 F.2d 1344 (CCPA 1982), the Board repeatedly chose to ignore relevant parts of the specification in construing the claims. Appx8, Appx20, Appx39. Yet those cases do not support the Board’s approach. With little discussion, *Van Geuns* merely states that “limitations are not to be read into the claims from the specification.” 988 F.2d at 1184. The cited section of *Self* contains no reference to the specification at all, but rather appears to dismiss the inventor’s assertions regarding the differences between his invention and prior art. These cases do not, as the Board suggests, undermine the importance of the specification to the claim-construction process—an importance emphasized by the plethora of more recent cases discussed above.

This Court recently has recognized the “fine line between reading claims *in light of* the written description, and importing limitations from the written description.” *Howmedica Osteonics Corp. v. Zimmer, Inc.*, 822 F.3d 1312, 1322 (Fed. Cir. 2016). “When the claims leave little doubt as to what is intended, reshaping the claims with material from the written description is clearly unwarranted.” *Id.* But construing “*unclear* claim terms . . . in light of the written description explanation is the proper claim construction technique.” *Id.* (emphasis

added). In other words, the specification should not be used to *alter* the clear meaning of claim terms, but it *must* be used to *construe* those terms requiring clarification. *See id.*

Accordingly, this Court often looks to the specification's description of the invention to construe the limitations of the claims. *See, e.g., Profectus Tech. LLC v. Huawei Techs. Co. Ltd.*, 823 F.3d 1375, 1380-81 (Fed. Cir. 2016) (affirming district court's construction of "mountable" to mean "having a feature for mounting" in part because in "every embodiment disclosed in the specification," the frame included a feature for mounting the device); *Sealant Sys. Int'l, Inc. v. TEK Global, S.R.L.*, 616 F. App'x 987, 992-93 (Fed. Cir. 2015) (construing patent for tire repair technology and defining "cooperating with" to require direct connection to tire where specification showed connectability and suggested no way in which the hose might "cooperate with a tire" if not connectable to it); *In re Abbott*, 696 F.3d at 1149-50 (construing "electrochemical sensor" to exclude sensors with external cables because specification criticized prior art with external cables and "every embodiment disclosed in the specification shows an electrochemical sensor without external cables").

The drawings in a specification are "highly relevant" to this inquiry. *See Advanced Steel Recovery, LLC v. X-Body Equip., Inc.*, 808 F.3d 1313, 1317 (Fed. Cir. 2015) (citation omitted) (concluding specification supported district court's

construction of “proximate end” because “every figure” depicting disputed connection showed a connection consistent with the court’s construction); *see Wi-LAN USA, Inc. v. Apple Inc.*, 830 F.3d 1374, 1381-82 (Fed. Cir. 2016) (construing “specified connection” to exclude embodiments with only one connection where specification “consistent[ly]” described “multiple specified connections,” including figures showing multiple user connections, and specification “never describe[d] a system with only one specified connection”); *Proxyconn*, 789 F.3d at 1299 (relying on specification language and drawing to construe claim); *Indus. Tech. Research Inst. v. Int’l Trade Comm’n*, 567 F. App’x 914, 918 (Fed. Cir. 2014) (affirming construction of “structured arc sheet” to mean “a sheet constructed in the shape of an arc” where “[a]ll of the figures and the language of the specification consistently indicate that the entire sheet must be constructed in the shape of an arc”).

Further, in construing a claim, a court should “consult the patent’s prosecution history, which, like the specification, provides evidence of how the PTO and inventor understood the claimed invention.” *Advanced Fiber Techs. (AFT) Trust v. J & L Fiber Servs., Inc.*, 674 F.3d 1365, 1372 (Fed. Cir. 2012); *see Proxyconn*, 789 F.3d at 1298 (noting that the Board should also “consult the patent’s prosecution history in proceedings in which the patent has been brought back to the agency for a second review”).

Having determined that certain claim terms required interpretation, the Board then failed to follow these well-established principles of construction and ignored key parts of the specification and prosecution history in construing Christy's claims. In concluding that the independent claims 1 and 10 are anticipated by Eiben and Hayden, the Board stayed narrowly focused on the language of the '640 Patent *claims* apart from any teaching in the specifications. Appx16-23, Appx48-52. Although it cited repeatedly to the specifications for Hayden and Eiben (even importing disclosures from those extrinsic references into the '640 Patent), the Board sought little or no guidance from the specification of the '640 Patent actually at issue here. Appx16-23, Appx48-52.

The Board thus ran afoul of the extensive authority mandating that claims “must be read in view of the specification, of which they are a part” and holding that the “specification is ‘the single best guide to the meaning of a disputed term’ and “[u]sually . . . is dispositive.” *SAS Institute*, 825 F.3d at 1347 (quoting *Phillips*, 415 F.3d at 1313). As the en banc Court recognized in *Phillips*, “We cannot look at the ordinary meaning of the term . . . in a vacuum. Rather, we must look at the ordinary meaning in the context of the written description and the prosecution history.” 415 F.3d at 1313 (citation omitted). As shown below, the specification and prosecution history confirm the ordinary and customary meaning of the claim terms and resolve any possible ambiguity in those terms. The Board's

construction of the claims, which ignores this intrinsic evidence, is not reasonable and should be reversed.

**B. The Board Erred In Construing Claims 1 And 10 To *Not* Require A Direct Connection Between The Vacuum Source, Valves, And Filters.**

Although neither party requested that the Board interpret “pneumatic communication” and it gave the parties no opportunity to provide briefs regarding the appropriate construction, the Board’s sua sponte construction of the term was central to both Decisions. Appx13-14, Appx44-45. The Board correctly noted that the term appears twice in each of Christy’s two independent claims. *Id.* Claims 1 and 10 require that:

- Each filter is in pneumatic communication through a corresponding one of the outlet ports. Appx203, 8:6-8, 8:62-64.
- The valves are in pneumatic communication between the vacuum source and a corresponding one of the outlet ports. Appx203, 8:9-11, 8:65-67.

Taken together, these provisions require “pneumatic communication” throughout the chain of (a) each filter, (b) its corresponding outlet port, (c) the corresponding valve, and (d) the vacuum source. But the Board determined that “pneumatic communication” could occur between these four components without some connective structure such as ductwork linking them. Appx14, Appx45. Christy does not challenge the notion that, as a general matter, pneumatic communication *may* occur without ductwork. But because Christy’s valves and vacuum source are

in ambient air, pneumatic communication cannot occur in the manner described in claims 1 and 10 without some type of connection, which is expressly required by the claims themselves.

Christy's contention that claims 1 and 10 require a direct physical connection between the filters, valves, and vacuum source is based on the claims' use of the terms "connected to" and "connection to." The claims require:

- Means to switch the filters from "*connection to*" the vacuum source to "*connection to*" ambient air. Appx203, 8:14-16, Appx204, 9:3-5, Appx821, 8:15-16 (emphasis added).
- Valves and filters that are "*connected to*" ambient air by the vacuum via corresponding valves and filters that are "*connected to*" the vacuum. Appx203, 8:17-20, Appx204, 9:6-9 (emphasis added).

The claims thus goes farther than simply requiring that the filters, ports, valves, and vacuum source engage in pneumatic *communication*. The plain language of claims 1 and 10 requires a physical *connection* between the filters, valves, and vacuum source to *enable* pneumatic communication among those components. Further, claims 5-6, 9, 14-15, and 18, which address the duration of the connections to ambient air and to the vacuum source, are dependent on the antecedent basis provided by claims 1 and 10 for the connections. Appx203, 8:34-41, 8:53-59, Appx204, 9:23-30, 10:6-11. It is impossible to switch from one connection to another unless there *is* a connection.



The specification fully supports this construction. For example, it states that the “a” port of each valve (31a, 32a, and 33a) is “connected to a vacuum source.” Appx201, 3:41-42. The specification also provides that “all of the filters . . . are connected to the vacuum source . . . through the valve vacuum ports . . . .” Appx202, 6:21-22, *see also* Appx201, 3:49-52 (“Each of the valves 31, 32 and 33 is normally *connected* so that the vacuum source 15 draws ambient air 16 through the cannister inlet port 14 into the cannister 10 and through the walls of the filters 21, 22 and 23.” (emphasis added)). Indeed, the only figure showing the configuration of the filters, valves, and vacuum source depicts a connection between the three components. Appx194, fig. 1.

Claims 1 and 10 also require that the valves be able to switch the filters to a “connection to ambient air.” Appx203, 8:14-16. One of the means by which this “connection” can occur is via an “ambient air duct,” which “extends from the ambient air port 31*b* into the source of ambient air 16.” Appx202, 5:16-18, Appx196, figs. 4 and 5. This further supports the interpretation that “connection,” as used in the ’640 Patent, requires some sort of connective structure.

During the patent prosecution, Christy made clear this requirement for a *direct, physical* connection between the filters, valves, and vacuum source. Before the Examiner, Christy explained the difference between the claimed structure and the prior art reference Nelson. Adding flow lines to Figure 1, Christy noted that

the block diagram showed the vacuum source “is *directly connected by the duct work* through the valves 31, 32 and 33 to their filters 21, 22 or 23 in the canister 10 in three discrete defined pneumatic paths.”<sup>8</sup> Appx263 (emphasis added), *see id.* (“the vacuum 15 is directly connected to the valves 32 and 33 and therefore to the filters 22 and 23 . . .”).

Finally, because Christy’s valves and vacuum source are in ambient air, there could be no pneumatic communication between those components and the filters without a physical connection. The machine simply would not work if the vacuum source were sucking on nearby ambient air. *See NEC Corp. v. Hyundai Elecs. Indus.*, 30 F. Supp. 2d 546, 553 (E.D. Va. 1998) (holding that construction that would frustrate the patent’s purpose is unpersuasive, adopting construction that is necessary to achieve the benefit of the patent).

By focusing on “pneumatic communication” and failing to note—much less to construe or apply—the terms “connected to” or “connection with,” the Board missed the real issue presented. The plain language of claims 1 and 10, the teachings in the specification, and the prosecution history clearly recite connecting structure between the vacuum source, valves, and filters. Indeed, without

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<sup>8</sup> Black & Decker quoted this portion of the prosecution history in its claim-construction brief filed in the district court. *See* Def.’s Resp. Br. on Claim Construction at 18, Dkt. No. 44, *CDC Larue Indus., Inc. v. Black & Decker*, Case No. 14-CV-286-CVE-FHM, In the United States District Court for the Northern District of Oklahoma.

connecting structure in Christy's vacuum cleaning machine, there can be no pneumatic communication. The vacuum source's intake would be sucking on the ambient air surrounding it, much like a child sucking on a straw connected only to air, and no dirty air would be drawn into the canister's inlet port and through the filter. Further, dependent claims 5, 6, and 9, which depend directly or indirectly from claim 1, and claims 14, 15, and 18, which depend directly or indirectly from claim 10, find antecedent basis for the term "connection" or "connect." The Board's decision that claims 1 and 10 do not require such connecting structure constitutes a clear error of law that should be reversed.

**C. The Board's Construction of "Canister" Is Unreasonable.**

The Board also decided—*sua sponte* and after briefing was complete—to construe "canister," which it construed simply to mean a "container." Appx13, Appx44. The Board offered no reasonable basis for this construction or the need for it.

The Board cited three sources in its construction analysis, but none support its ultimate conclusion. First, it quoted a general dictionary that defines "canister" as "[a] small box or case for holding tea, coffee, etc." Appx12-13, Appx43 (quoting WEBSTER'S NEW COLLEGIATE DICTIONARY, 121 (2d ed. 1951)). Notably, the word "container" does not appear in this definition, so the Board apparently chose not to utilize the dictionary definition.

The Board also cited the statements of Christy’s counsel at the oral hearing that a canister, cabinet and compartment are “all some form of container.” Appx13, Appx43. Counsel’s statements were made in response to the Board’s query regarding whether “cabinet,” *i.e.*, the term used by Hayden to describe the clean and dirty air chambers combined, and “canister” have the same meaning. Appx736-737. The Board did not ask Christy’s counsel to define canister as used in the ’640 Patent. *Id.*

Finally, the Board cited a declaration offered by Black & Decker stating that the “‘canister of the vacuum is the part where the filters reside and dust is separated from the incoming vacuumed air and collected.’” Appx13, Appx44. But the Board did not adopt this construction.

Instead, it summarily—and with no further analysis or citation to authorities<sup>9</sup> or evidence—concluded: “Based on the entire record, we determine that the ordinary and customary meaning of the term ‘canister,’ as would be understood by one of ordinary skill in the art in the context of the entire disclosure, is a ‘container.’” Appx13, Appx44. This bare construction finds no support in any of the extrinsic evidence cited by the Board and expands the definition of “canister” to include literally *any* type of container, regardless of its structure, function, or

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<sup>9</sup> The Board cited *In re Translogic Technology, Inc.*, 504 F.3d 1249 (Fed. Cir. 2007), Appx13, Appx44, only for the legal standard allegedly applied by the Board. That case does not define “canister.”

what it may or may not contain. The Board merely substituted one generic word (container) for another (canister) and provided no guidance for use in determining whether the '640 Patent was anticipated by prior art. The Board's construction is so "broad" as to be *unreasonable*.<sup>10</sup> Accordingly, it should be reversed.

#### **IV. The Board Erred In Finding That Claims 1-18 Of The '640 Patent Were Not Patentable.**

##### **A. Claims 1 And 10 Were Not Anticipated By Hayden And Eiben.**

The Board found that the vacuum cleaning machine claimed by the '640 Patent was anticipated by both Hayden and Eiben and thus was unpatentable under 35 U.S.C. § 102(a). To anticipate a claimed invention, a single prior art reference must disclose *each and every element* of the claimed invention within the four corners of the document. *Net MoneyIN, Inc. v. VeriSign*, 545 F.3d 1359, 1369 (Fed. Cir. 2008). In addition, the prior art reference must disclose those elements "arranged or combined in the same way as in the claim." *Id.* at 1370; *see also Lindemann Maschinenfabrik GMBH v. Am. Hoist & Derrick Co.*, 730 F.2d 1452, 1458 (Fed. Cir. 1984) (finding no anticipation where prior art "disclose[d] an entirely different device, composed of parts distinct from those of the claimed invention, and operating in a different way to process different material differently"). This means that the claims "cannot be 'treated . . . as mere catalogs

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<sup>10</sup> Further, as shown below in Part IV.A.1(c), this construction led the Board to a result that conflicts with its (and the district court's) construction of "ambient air."

of separate parts, in disregard of the part-to-part relationships set forth in the claims and that give the claims their meaning.” *Therasense, Inc. v. Becton, Dickinson & Co.*, 593 F.3d 1325, 1332 (Fed. Cir. 2010) (quoting *Lindemann*, 730 F.2d at 1459). The reference must also provide a person with ordinary skill in the art with sufficient information to make the invention at issue “without undue experimentation.” *Impax Labs., Inc. v. Aventis Pharms. Inc.*, 545 F.3d 1312, 1314 (Fed. Cir. 2008). As shown below, the Board erred in finding that Hayden and Eiben disclosed all of the elements of claims 1 and 10 and arranged those elements in the same way as Christy’s invention.

**1. Hayden fails to anticipate claims 1 and 10.**

**(a) Hayden does not disclose valves that are “connected to” a vacuum source.**

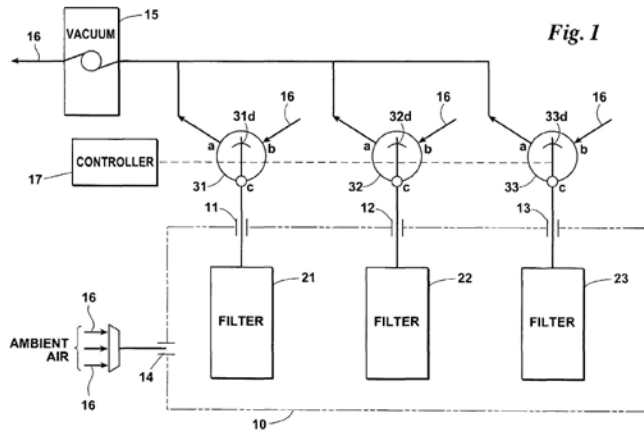
Claims 1 and 10 require “each said valve being in pneumatic communication between said vacuum source and a corresponding one of each of said outlet ports” and “corresponding ones of said valves and filters which are connected to said vacuum.” Appx203, 8:9-20, Appx203-204, 8:65-9:9. Hayden’s valves are not connected to the vacuum source but are instead surrounded by open space inside the clean air chamber. Appx334, 3:38-40. The suction blower, which Black & Decker equates to the vacuum source, exerts suction on the chamber as a whole. Appx334, 3:55-57. The Board recognized that a common chamber exists between the valves and the vacuum source, but it deemed that fact irrelevant based on its

erroneous conclusion that claims 1 and 10 do not require connective structure between the valves and vacuum source. Appx20-21. As shown above, claims 1 and 10 clearly *do* require a physical connection between the valves and vacuum source. Because Hayden did not disclose such a connection, Hayden could not have anticipated claims 1 and 10, and the Board's anticipation Decision should be reversed on this basis alone.

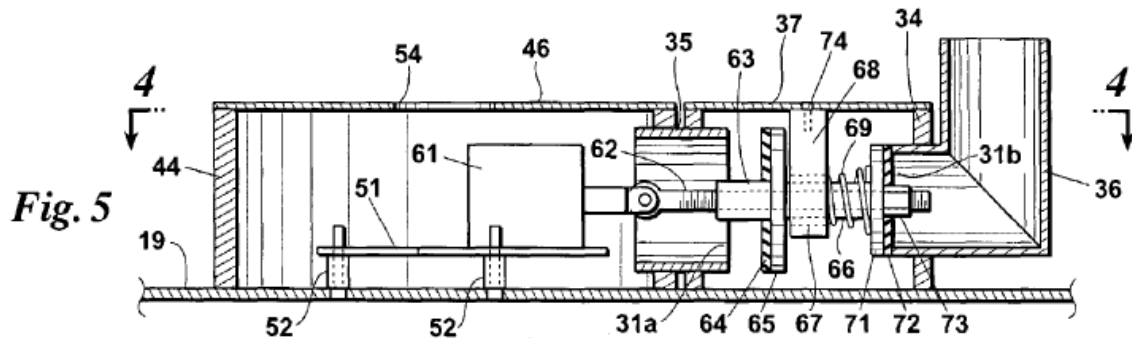
(b) **Hayden's valves are not in ambient air.**

Claims 1 and 10 require at least two or three "valves disposed outside of said canister" and through which "*ambient* air" may be "drawn." Appx203, 8:8-9, 8:16-17 (emphasis added). The Board correctly interpreted "ambient air" as the "air surrounding the canister." Appx12. Based on this interpretation, which describes the location of ambient air relative to the canister, the valves (31, 32, and 33), which are outside of the canister (10), must be in ambient air.

The specification supports this construction. Figure 1 depicts ambient air (16) entering through the “b” port of each valve (31b, 32b, and 33b). Appx194.



The “b” port is in pneumatic communication with ambient air (16), which is accessed when the valve’s corresponding filter is backflushed. Appx201, 3:42-44; *see also* Appx201, 3:57-59 (“The suction through the filters 22 and 23 draws ambient air 16 through the valve port 31 “b” and into the filter . . .”), Appx263 (noting during prosecution of the ’640 Patent that ambient air is “pulled through the valve ambient air port 31b . . .”). As shown in Figure 5, each of the valves obtains this ambient air through an ambient air duct (36) that extends just above the valve itself. Appx196, fig. 5, Appx202, 5:16-18.





All of these elements exist within the protective cover of the machine. Appx195, fig. 2, Appx201, 4:22-25. The valves of the '640 Patent are plainly located in ambient air.

By contrast, Hayden's valves are not in ambient air but are instead located inside Hayden's negative-pressure clean air chamber. Hayden locates his valves inside a "cabinet" that is "essentially airtight and operating throughout its internal parts at sub-atmospheric pressure . . . ." Appx333, 1:15-17. Because of this low pressure inside the cabinet, all that is necessary to clean the filters is to introduce ambient air into the dirty air chamber containing the filters. Appx333, 2:28-33. This is done via the valves, which have dual ports. Appx333, 2:33-36. One is open to the clean air chamber; the second is the mechanism by which Hayden imports ambient air into the cabinet. Appx335, 5:38-41.

Recognizing that ambient air is the air *surrounding* the cabinet and, therefore, is not available *inside* the cabinet, Hayden transports ambient air from *outside* the cabinet to the valves inside the clean air chamber of the cabinet. Appx334, 3:45-55. For large machines with a "dozen or so filters," Hayden notes that his machine can provide ambient air to the valves "through a manifold located within [the] chamber." Appx334, 3:45-48. Smaller machines can utilize "air inlet port[s]" to transfer ambient air from *outside of the dust collector* to the valves.

Appx334, 3:49-55; *see* Appx335, 5:38-41 (describing “duct conveying atmospheric air to one of said valve seats”). Both means recognize the need to import ambient air into the clean air chamber because it cannot be found there otherwise.

Claims 1 and 10 require valves located outside the canister and in ambient air. Hayden’s valves are not located in ambient air, thus requiring Hayden to import from outside of the machine the ambient air needed to backflush the filters.<sup>11</sup> Hayden does not disclose the same elements “arranged or combined in the same way” as claims 1 and 10 and thus did not anticipate those claims. *Net MoneyIN*, 545 F.3d at 1370-71.

**(c) Hayden’s valves are inside the canister.**

Applying its overly broad construction of canister, the Board concluded Hayden’s dirty air chamber is a “container” and thus constitutes the canister required by claims 1 and 10. Appx20. This holding is squarely at odds with the Board’s construction of ambient air to mean the “air surrounding the canister.” Appx12.

The clean air chamber sits immediately on top of the dirty air chamber that the Board has deemed to be the canister. But, as shown above, Hayden himself

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<sup>11</sup> When Christy argued this clear distinction below, the Board summarily rejected it with no analysis, merely stating, “We are not persuaded.” Appx19. This is but one example (discussed above) in which the Board incorrectly placed the burden on Christy to persuade the Board as to the validity of its claims.

recognized his clean air chamber is *not* in ambient air because he was required to import ambient air to the valves located in that chamber. So, the dirty air chamber is not “surrounded” by ambient air. It alone cannot be the canister.

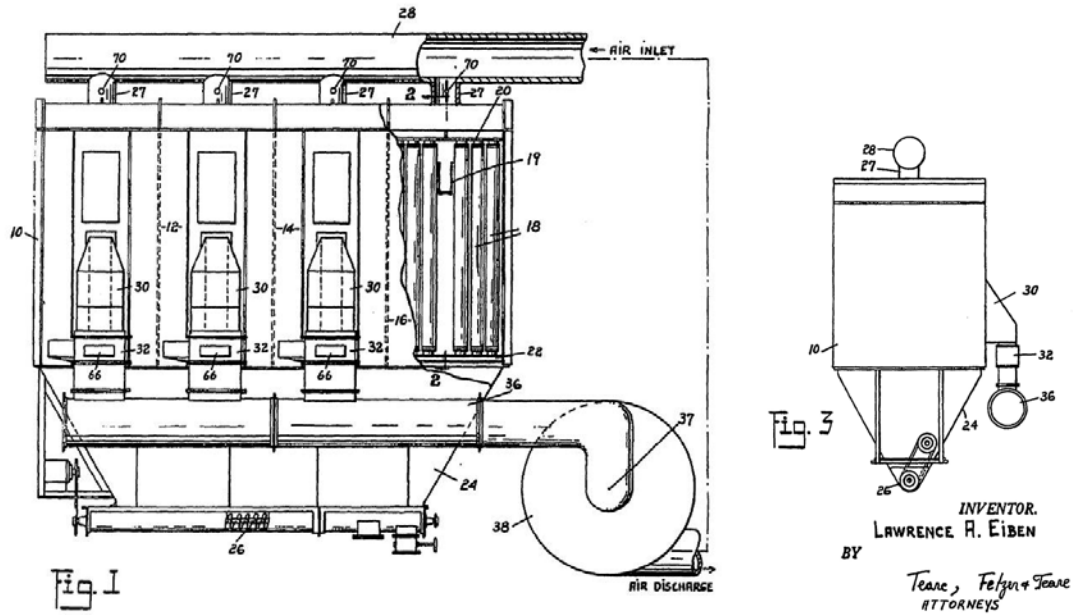
Hayden’s “cabinet”—comprised of *both* the dirty air chamber and the clean air chamber—is surrounded by ambient air. The only reasonable interpretation is that Hayden’s “cabinet” equates to Christy’s “canister.” Because Hayden’s valves are *inside* the clean air chamber which is *inside* the canister, Hayden did not anticipate claims 1 and 10, which require that the valves be situated *outside* of the canister.

**2. Claims 1 and 10 were not anticipated by Eiben.**

**(a) Eiben does not disclose connectivity between the filters and the valves and vacuum source.**

As shown above, claims 1 and 10 require a physical connection between the filters, valves, and vacuum source. Eiben does not provide this connective structure.

Eiben’s figures 1 and 3 show that Eiben’s valve (32) is connected to the compartment (10, 12, 14, or 16) by exhaust ductwork (30). Appx948.



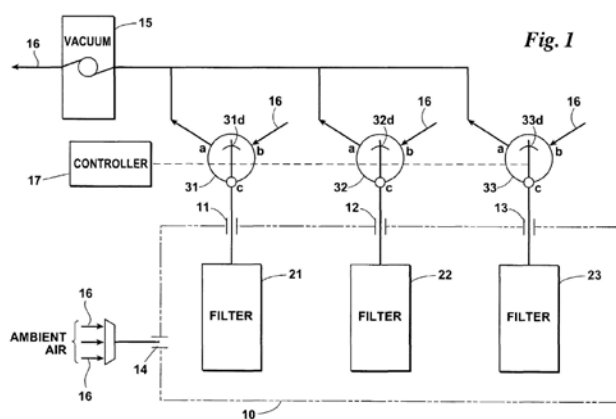
This exhaust ductwork (30) extends “[d]ownwardly from the side of each of the compartments.” Appx953, 2:60-61. Each filter bag (18) is connected at the top to a plate (20) and at the bottom to another plate (22). Appx953, 2:48-52. The filter bags (18) *are not connected* to the valve (32). As a result, they are also not connected to the vacuum source (blower 38), which connects to the valve through the clean air pipe (36). Appx953, 2:64:67. The filter must be physically connected to *both* the valve and the vacuum source under claims 1 and 10. Eiben’s filter bags do not meet these requirements.

The Board did not find that these physical connections exist in Eiben. Instead, based on its construction of “pneumatic communication” and failure to recognize the claim’s separate “connection” requirements, the Board concluded that no connective structure was necessary. Appx51-52. As shown above, this

construction was unreasonable and incorrect. The Board's anticipation decision based on this flawed construction is also erroneous and should be reversed.

(b) **Eiben lacks a one-to-one correspondence between the valves and filters.**

Claims 1 and 10 require that each filter has a “corresponding” valve. Claim 1 requires “at least two filters” and “at least two valves.” Appx203, 8:5-6, 8:8. Claim 10 largely restates claim 1 except that it requires *exactly* “three filters” and “three valves.” Appx203, 8:61, 8:64. Both claims describe “corresponding ones of said valves and filters.” Appx203, 8:19, Appx204, 9:7-8. The specification provides that “[e]ach of the valves 31, 32 and 33 has a continuously opened port 31c, 32c or 33c which is in constant communication through a *respective* outlet port 11, 12 or 13 with a *respective* filter 21, 22 or 23.” Appx201, 3:32-36 (emphasis added). Figure 1 demonstrates this one-to-one relationship.



Appx194. Each compartment of Eiben's bag house contains multiple filter bags but only one valve. Therefore, Eiben does not disclose the one-to-one relationship

between valves and filters required by claims 1 and 10. Accordingly, it did not anticipate those claims.

(c) **Eiben does not disclose a canister.**

Based on its amorphous construction of “canister,” the Board determined that multiple compartments in Eiben’s bag house constitute a single “container” and thus a “canister” as described in claims 1 and 10 of the ’640 patent. Citing no intrinsic or extrinsic evidence supporting its determination, the Board nonetheless found “nothing in the claim language . . . precludes Eiben’s ‘compartment units 10, 12, 14, and 16 [that] are assembled together and mounted atop a hopper 24,’ from being a canister . . . .” Appx50-51. But, with respect to Hayden, the Board found that only *one chamber* of Hayden’s two-chamber cabinet is a canister. The only thing consistent about these findings is that they are to Christy’s detriment.

The Board’s arbitrary application of its meaningless construction of “canister” is not reasonable and should be rejected. Its decision that Eiben anticipated Christy’s patent should be reversed.

**B. Claims 1-18 Are Not Obvious Over The Cited References.**

In ruling on Black & Decker’s obviousness challenge under 35 U.S.C. § 103(a), the Board was required to make findings regarding: (1) the scope and content of the prior art on which Black & Decker relied; (2) the differences between the prior art and Christy’s claims; (3) the level of ordinary skill in the art

at the time the invention was made; and (4) objective evidence of nonobviousness, if any. *Merck & Cie v. Gnosis S.P.A.*, 808 F.3d 829, 833 (Fed. Cir. 2015). “If all elements of the claims are found in a combination of prior art references,” then the Board should have considered whether a person of ordinary skill in the art would have been motivated to combine those references *and* would have reasonably expected those efforts to be successful. *Id.*; see *Magnum Tools*, 829 F.3d at 1381.

**1. Claims 1, 4-6, 10, and 13-15 were not obvious over the prior art.**

These claims of the '640 Patent relate to the controller described by Christy and its use to set the cycle times in switching the device between vacuum and backflush modes. Claims 4-6 and 13-15 are dependent on claims 1 and 10. The Board found it would have been obvious to combine the bag house controller disclosed by Wellan, Appx337, with either Hayden's or Eiben's device to obtain the invention described in these claims. Appx23-25, Appx52-55. Because, as shown above, neither Hayden nor Eiben disclose all of the elements of the independent claims 1 and 10, the Board's obviousness finding based on those references was also erroneous.

Further, the Board failed to articulate a reason *why* a person with skill in the art of bag houses like Eiben and Wellan would have been motivated to combine those references to create a *portable vacuum cleaner* or reasonably would have

believed that such an effort would have been successful. Thus, the Board's Decisions should be reversed on that basis as well.

**2. The prior art did not render obvious claims 7-9 and 16-18.**

The Board found that that “the combination of DE219, Howeth, and Wellan teach the interchangeability with a flap valve of a piston reciprocally disposed between two ports, and the known, predictable use of a spring for biasing a piston and a switch for energizing and de-energizing an electrical solenoid.” Appx27, Appx57. The Board found that in combination with Hayden or Eiben, these prior-art references render dependent claims 7-9 and 16-18 obvious. Appx27, Appx57-58. It also found claims 9 and 18 would have been obvious over Eiben, DE219, Howeth, and Wellan. Appx58. Because these findings depend on the Board's erroneous conclusion that Hayden and Eiben disclose each and every element of the independent claims 1 and 10, the Board's finding that these dependent claims were obvious is also erroneous.

Further, the Board failed to identify with any level of specificity the basis for its conclusion that a person skilled in the relevant art(s) would have been motivated to combine the cited references, which range from bag houses (Eiben and Wellan) to drilling equipment (Howeth, Appx361) to vacuum cleaners (DE219, Appx382) to dust collectors (Hayden). Instead, the Board summarily asserted that this combination was “nothing ‘more than the predictable use of prior art elements



according to their established functions.” Appx27, Appx57 (citing *KSR Int’l Co. v. Teleflex, Inc.*, 550 U.S. 398, 417 (2007)). The authority cited by the Board recognizes that this type of conclusory assertion is insufficient to sustain a finding of obviousness. *KSR Int’l*, 550 U.S. 418 (quoting *In re Kahn*, 441 F.3d 977, 988 (Fed. Cir. 2006)) for the proposition that “rejections on obviousness grounds cannot be sustained by mere conclusory statements; instead, there must be some articulated reasoning with some rational underpinning to support the legal conclusion of obviousness”). In light of the varied fields covered by the cited references, the Board’s summary conclusion that it was obvious to combine them is insufficient to support a finding of obviousness.

**3. Dependent claims 2, 3, 11, and 12 were not obvious over Hayden and von Stackelberg.**

Claims 2 and 11 describe the means by which Christy divides its canister into an upper zone of high velocity vortex airflow and a lower zone of reduced velocity airflow. Appx201, 4:48-50, 8:21-24, 9:10-13. In claims 3 and 12, Christy describes the way in which a duct (41) directs airflow downwardly from the inlet port (14) of the canister (10) and the baffle (42) redirects the downward flow to a circumferential flow. Appx195, fig. 2, Appx201, 4:35-49. The purpose of the duct (41) and baffle (42) is to allow particles backflushed from the filters to settle to the bottom of the canister instead of recycling throughout the canister. Appx201, 4:50-54.

The Board found that these claims are obvious over the combination of Hayden with von Stackelberg. Appx27-29. Von Stackelberg discloses a drum lid used to minimize liquid carryover out of a container. Appx397-402, figs. 1-10, Appx403, 1:7-11; 2:30-34. This obviousness finding is also dependent on the Board's erroneous conclusion that Hayden anticipates each and every element of independent claims 1 and 10. Therefore, this holding is similarly erroneous.

In addition, the Board once again failed to provide a sufficient answer regarding why a person skilled in the art would have combined Hayden and von Stackelberg. The Board only adopts Black & Decker's argument that such a person "would have combined von Stackelberg's conduit and baffle with Hayden's canister, because the references teach 'the benefits of preventing filters and outlets from being clogged from foreign particulates.'" Appx28 (quoting Appx186-187). Neither the Board nor Black & Decker cite the specific parts of those references on which they rely. Appx28, Appx186-187. Even if, as they suggest, both references expressed a desire to prevent dust and dirt from clogging vacuum filters, this does not explain *why* a person skilled in the art would think that von Stackelberg's lid—used for minimizing the amount of *liquids* carried over into a vacuum receptacle—was the answer. The Board's ruling is not based on substantial evidence and should be reversed.

## **CONCLUSION**

For the reasons set forth above, the Board erred in holding claims 1-18 of the '640 Patent to be unpatentable. This Court should reverse both of the Board's Final Decisions.

Respectfully submitted,

/s/ Amelia A. Fogleman

Frank J. Catalano

Amelia A. Fogleman

Paul E. Rossler

Alicia J. Edwards

**GABLEGOTWALS**

100 West 5th Street, Suite 1100

Tulsa, Oklahoma 74103

(918) 595-4800

afogleman@gablelaw.com

*Counsel for Appellant Christy, Inc.*

November 28, 2016

# **ADDENDUM**

[Trials@uspto.gov](mailto:Trials@uspto.gov)  
571-272-7822

Paper 24  
Entered: June 17, 2016

UNITED STATES PATENT AND TRADEMARK OFFICE

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BEFORE THE PATENT TRIAL AND APPEAL BOARD

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BLACK & DECKER (U.S.) INC. and  
STANLEY BLACK & DECKER, INC.,  
Petitioner,

v.

CHRISTY, INC.,  
Patent Owner.

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Case IPR2015-00468  
Patent 7,082,640 B2

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Before MICHAEL W. KIM, DONNA M. PRAISS, and  
KRISTINA M. KALAN, *Administrative Patent Judges*.

PRAISS, *Administrative Patent Judge*.

FINAL WRITTEN DECISION  
35 U.S.C. § 318(a) and 37 C.F.R. § 42.73

IPR2015-00468  
Patent 7,082,640 B2

## I. BACKGROUND

Black & Decker (U.S.) Inc. and Stanley Black & Decker, Inc. (collectively, “Petitioner”) filed a Petition to institute an *inter partes* review of claims 1–18 (the “challenged claims”) of U.S. Patent No. 7,082,640 B2 (Ex. 1001, “the ’640 patent”) pursuant to 35 U.S.C. §§ 311–319. Paper 1 (“Pet.”). A Preliminary Response was filed by Christy, Inc. (“Patent Owner”). Paper 12 (“Prelim. Resp.”). The Board granted the Petition as to certain grounds and instituted trial. Paper 13 (“Dec. on Inst.”). Although Petitioner proposed fourteen grounds of unpatentability, the panel instituted trial only on the following five grounds:<sup>1</sup>

- (1) Claims 1 and 10 as anticipated by Hayden;
- (2) Claims 1, 4–6, 10, and 13–15 as obvious over Hayden and Wellan;
- (3) Claims 7–9 and 16–18 as obvious over Hayden, DE219, and Howeth;
- (4) Claims 9 and 18 as obvious over Hayden, DE219, Howeth, and Wellan; and
- (5) Claims 2, 3, 11, and 12 as obvious over Hayden and von Stackelberg.

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<sup>1</sup> US Patent No. 5,108,473, Apr. 28, 1992 (Ex. 1003) (“Hayden”); US Patent No. 3,680,285, Aug. 1, 1972 (Ex. 1004) (“Wellan”); DE 101 01 219 A1, July 25, 2002 (Ex. 1006; Ex. 1008 (translation)) (“DE219”) (citations herein are to the translation, Ex. 1008); US Patent No. 4,465,497, Aug. 14, 1984 (Ex. 1007) (“Howeth”); and US Patent No. 6,767,380 B2, July 27, 2004 (Ex. 1010) (“von Stackelberg”).

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*Id.* at 22.<sup>2</sup>

During trial, Patent Owner filed a Patent Owner Response.<sup>3</sup> Paper 16 (“PO Resp.”). Petitioner filed a Reply to Patent Owner’s Response relying on the Declaration of Jeffrey P. Grant (Ex. 1013) and the Second Declaration of Jeffrey P. Grant (Ex. 1015). Paper 17 (“Pet. Reply”). An oral hearing was held on March 22, 2016, and a transcript of the hearing is included in the record. Paper 23 (“Tr.”).

We have jurisdiction under 35 U.S.C. § 6(c). This final written decision is issued pursuant to 35 U.S.C. § 318(a) and 37 C.F.R. § 42.73. For the reasons that follow, we determine that Petitioner has met its burden to prove by a preponderance of the evidence that claims 1–18 of the ’640 patent are unpatentable.

*A. Related Proceedings*

The ’640 patent is the subject of *CDC Larue Indus., Inc. v. Black & Decker Corp.*, Civil Action No. 4:14-cv-00286 (N.D. Okla.). Pet. 1; Paper

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<sup>2</sup> The Decision on Institution contains a typographical error on page 21. We instituted trial only on claims 9 and 18 over Hayden, DE219, Howeth, and Wellan, and we did not institute trial on all of claims 7–9 and 16–18 over Hayden, DE219, Howeth, and Wellan. *Compare* Dec. on Inst. 6–7, *with id.* at 22.

<sup>3</sup> Patent Owner includes the Declaration of David L. McCutchen (Ex. 2001) in a list of exhibits on page iii of Patent Owner’s Response without citing or relying on it in Patent Owner’s Response. *See generally* PO Resp. Incorporation of arguments from one document into another document by reference is not permitted; arguments not raised in the response itself are deemed waived. 37 C.F.R. § 42.6(a)(3); Paper 14 (Scheduling Order), 3. Therefore, we give no weight to the Declaration of David L. McCutchen for purposes of this Decision.

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10, 2. It is also the subject of concurrently-filed *inter partes* review proceeding IPR2015-00472.

*B. The '640 Patent (Ex. 1001)*

The '640 patent, titled “Ambient Air Backflushed Filter Vacuum,” is directed to a filtered vacuum system in which dust is cleaned from the filters with backflushed ambient air. Ex. 1001, 1:6–8. The device comprises a canister<sup>4</sup> having at least two filters, an inlet port, and at least two outlet ports that are in pneumatic communication with each of the filters. *Id.* at Abstr. At least two valves are disposed outside of the canister, each in pneumatic communication between a vacuum source and an outlet port so as to permit air to be drawn through the filters. *Id.* The valves are operated by a controller which switches “the filters from the vacuum source to ambient air so as to permit ambient air to be sequentially intermittently drawn through corresponding valves and filters.” *Id.* Figure 1 below is a block diagram of the ambient air backflushed filter vacuum system. *Id.* at 3:1–2.

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<sup>4</sup> The '640 patent uses the spelling “cannister.” *See* Ex. 1001, *passim*. We use the common spelling “canister” for purposes of this decision.



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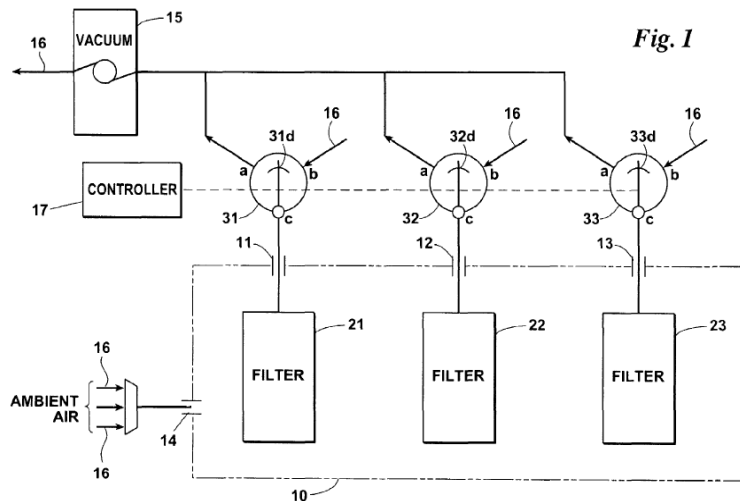
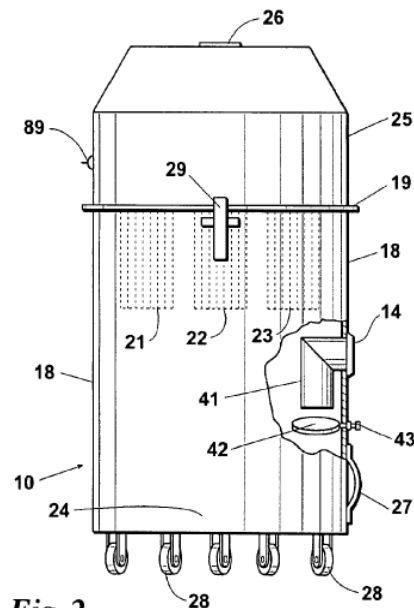


Figure 1 shows multiple filters 21, 22, 23 in canister 10 having inlet port 14 through which ambient air 16 flows, and outlet ports 11, 12, 13 through which the filters are in pneumatic communication with vacuum source 15. *Id.* at 3:29–31, 46–48. Controller 17 causes valves 31, 32, 33 disposed outside of canister 10 to switch between an open position “a” to vacuum source 15 and a closed position “b” that draws in ambient air 16 to filters 21, 22, 23. *Id.* at 3:28–48.

Figure 2 below is a side elevation of the ambient air backflushed filter vacuum. *Id.* at 3:3–4.

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**Fig. 2**

Figure 2 shows cylindrical canister 10 topped with plate 19. Filters 21, 22, 23 are mounted to the bottom of plate 19 and pneumatically communicate through outlet ports in plate 19 to vacuum source 15 (not shown) mounted above plate 19. Vacuum source 15 is protected by cover 25 seated on plate 19 and secured with latches 29. *Id.* at 4:13–34. Opening 26 in cover 25 exhausts air discharged from vacuum source 15. *Id.* at 4:26–27. Inlet port 14 is shown with duct 41 extending below filters 21, 22, 23. Baffle 42 is positioned below the outlet end of duct 41 to redirect air flow such that (1) there is little turbulence below baffle 42 and (2) particles that settle to bottom 24 of canister 10 are less likely to be recycled through filters 21, 22, 23. *Id.* at 4:35–54.

### *C. Illustrative Claim*

Claims 1 and 10 of the '640 patent are the only independent claims at issue. Claim 1, reproduced below, is illustrative of the claimed subject matter:

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1. A vacuum cleaning machine comprising  
a cannister having an inlet port and at least two outlet ports,  
at least two filters disposed inside of said cannister, one in  
pneumatic communication through a corresponding one of each  
of said outlet ports,  
a vacuum source,  
at least two valves disposed outside of said cannister, each said  
valve being in pneumatic communication between said vacuum  
source and a corresponding one of each of said outlet ports and  
permitting air to be drawn by said vacuum source from said  
inlet port simultaneously through corresponding ones of said  
filters and  
means for sequentially operating said valves to switch said  
filters from connection to said vacuum source to connection to  
ambient air and permitting ambient air to be drawn through  
corresponding ones of said valves and said filters which are  
connected to ambient air by said vacuum via corresponding  
ones of said valves and filters which are connected to said  
vacuum.

Ex. 1001, 8:4–20 (paragraphing added).

## II. ANALYSIS

### A. *Person of Ordinary Skill in the Art*

Petitioner asserts that the field of the invention is “vacuum cleaning machines” and “[t]he ordinary artisan in the field would typically have a bachelor’s level degree in mechanical engineering (or gained such knowledge by equivalent experience), and experience developing vacuum machines that filter air.” Pet. 26 (citing Ex. 1001, 1:6–9; Ex. 1013 ¶ 8). Patent Owner does not dispute Petitioner’s definition of a person of ordinary skill in the art or provide an alternative definition in response.

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For purposes of this Decision, we consider the cited prior art as representative of the level of ordinary skill in the art. *See Okajima v. Bourdeau*, 261 F.3d 1350, 1355 (Fed. Cir. 2001) (finding the absence of specific findings on “level of skill in the art does not give rise to reversible error ‘where the prior art itself reflects an appropriate level and a need for testimony is not shown’” (quoting *Litton Indus. Prods., Inc. v. Solid State Sys. Corp.*, 755 F.2d 158, 163 (Fed. Cir. 1985))). To the extent that we need to consider the parties’ positions on the issue, we adopt Petitioner’s position.

#### *B. Claim Interpretation*

In an *inter partes* review, claim terms in an unexpired patent are interpreted according to their broadest reasonable construction in light of the specification of the patent in which they appear. 37 C.F.R. § 42.100(b); *see also In re Cuozzo Speed Techs., LLC*, No. 778 F.3d 1271, 1278 (Fed. Cir. 2015) (“We conclude that Congress implicitly adopted the broadest reasonable interpretation standard in enacting the AIA.”), *cert. granted sub nom. Cuozzo Speed Techs., LLC v. Lee*, 136 S. Ct. 890 (mem.) (2016). Under that standard, claim terms are given their ordinary and customary meaning, as would be understood by one of ordinary skill in the art in the context of the entire disclosure. *In re Translogic Tech., Inc.*, 504 F.3d 1249, 1257 (Fed. Cir. 2007). Also, care is taken not to read a particular embodiment appearing in the written description into the claim if the claim language is broader than the embodiment. *See In re Van Geuns*, 988 F.2d 1181, 1184 (Fed. Cir. 1993) (“limitations are not to be read into the claims from the specification”).

In the Decision on Institution, we interpreted various claim terms of the ’640 patent as shown in the following two tables:

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**Table 1. Claim Terms**

Term	Interpretation
“ambient air”	“air surrounding the canister”
“drawn”	“pulled in by negative pressure”
“a piston reciprocally disposed between said two ports”	“a piston located between the claimed ports of the valve housing, and that moves back and forth between the claimed ports”

Dec. on Inst. 7–9.

**Table 2. Means-Plus-Function Claim Terms**

Term	Function	Structure
Means for sequentially operating	Switching the filters from connection to said vacuum source to connection to ambient air	Solenoid for each valve
Means for setting said intermittent time	Actuating the solenoid after a length of time to switch the valve to ambient air	Cam motor or backflush timer in controller
Means for setting a cycle time	Actuating the solenoid after a length of time to switch the valve to ambient air	Cam motor or delay timer in controller
Means biasing said piston	Acts to bias the piston	Coil spring
Means for over–coming said bias	Overcoming spring bias when sequentially operating the valves	Solenoid for each valve
Means for energizing . . . de–energizing	Opening or closing or actuation of switches to energize solenoids	Switches
Means cooperable with said inlet port	Divides canister into an upper zone of high velocity vortex air flow and a lower zone of reduced velocity air flow	Duct and baffle

*Id.* at 9–10.

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Patent Owner does not raise any claim construction issues in its Response. *See* PO Resp. 4. Petitioner challenges only our construction of the term “ambient air.” *See* Pet. Reply 14–15. Neither party requested construction of the claim terms “canister” and “pneumatic communication.” Because the parties dispute whether the evidence shows a “canister” and “pneumatic communication” as claimed, however, we include claim constructions for these terms. Our analysis of the terms “ambient air,” “canister,” and “pneumatic communication” follows. Regarding the remaining terms for which a claim construction was requested, after reconsidering everything anew, we adopt the constructions as stated in Tables 1 and 2 for the reasons stated in our Decision on Institution. Dec. on Inst. 7–10.

#### *Ambient Air*

Petitioner proposes “ambient air” means “air from the area surrounding the outside of the vacuum cleaning machine that has not been forced or compressed.” Pet. 13. Petitioner asserts this construction is consistent with the Specification, which confirms ambient air is outside the vacuum machine, and that Patent Owner disavowed forced or compressed air from being ambient air during prosecution. *Id.* at 13–14.

The district court found the meaning of “ambient air” was not limited by clear and unmistakable evidence to either (1) air surrounding the outside of the vacuum cleaning machine or (2) air that is not forced or compressed. Opinion and Order, Ex. 2004, 6–14. In our Decision on Institution, we agreed with the district court’s construction and analysis, which is broader than Petitioner’s proposed construction, and found it consistent with the Specification. Dec. on Inst. 8. Specifically, Figure 2 of the ’640 patent

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shows cover 25 “seated on” plate 19 to protect the valves, the operating mechanisms, the controller, and the vacuum source, which are all “mounted above” plate 19. Ex. 1001, 4:22–25. Thus, ambient air coming through the valves may come from the vacuum head under the cover; it need not come exclusively from outside the vacuum machine as Petitioner asserts. There is no evidence in the record whether the ambient air under the cover necessarily would have a particular pressure, including whether it is under atmospheric pressure. *See* Tr. 43:13–44:2 (Patent Owner describing ambient air as being “in comparison to what is inside of the cannister”).

Petitioner contends that its proposed construction should be adopted because (1) it is not dependent upon what constitutes the canister and (2) the ’640 patent is ambiguous or silent regarding “whether the ducts drawing in the ambient air receive re-circulated air from under the cover 25” or “whether they lead outside the cover 25 to the exterior of the machine.” Pet. Reply 14. Petitioner asserts that “intrinsic evidence shed[s] light on that ambiguity” because prior art was distinguished during prosecution on the basis of forced air being recirculated inside the prior art apparatus. *Id.* at 14–15 (citing Ex. 1002, 35–36, 59–60).

During prosecution, Patent Owner distinguished a pulse back cleaning system for multiple reasons, including the reason that the claimed invention “does not flip-flop between vacuuming and blowing.” File Wrapper of U.S. Patent No. 7,082,640 B2, Ex. 1002, 36. Patent Owner also distinguished other prior art for the reason that it “cannot function without a second centrifugal fan and associated components and limitation (e.g., transverse duct and array of parallel ducts)” whereas the invention was described as “valve 31 and filter 21 are not connected to any other fan, compressor or

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vacuum source.” *Id.* at 59. We agree with the district court that the intrinsic evidence does not present a clear and unmistakable disavowal of the source of ambient air. *Thorner v. Sony Comput. Entm’t Am. LLC*, 669 F.3d 1362, 1366 (Fed. Cir. 2012) (the standard for disavowal of claim scope is “exacting”). Figures 2–5 of the ’640 patent show three ambient air ducts 36 under cover 25. Ex. 1001, Figs. 2–5, 3:1–9, 4:22–27, 5:15–17. As the district court found, “[i]t is not clear from the drawing where that duct terminates, and the detailed description states only that ‘[t]he ambient air duct 36 extends from the ambient air port 31b into the source of ambient air 16.’” Ex. 2004, 12. Similarly, the district court found that the statements in the prosecution history regarding the ambient air also “do not exclude the possibility that ‘ambient air’ could come from inside—or both inside and outside—the vacuum head during backflushing.” *Id.* at 13. Moreover, the distinctions over the prior art included “differences unrelated to the source of the air used for backflushing.” *Id.* Based on the complete trial record, including the prosecution history, we agree with the district court’s construction of “air surrounding the canister” as the broadest reasonable interpretation of the term “ambient air.” *See Microsoft Corp. v. Proxyconn, Inc.*, 789 F.3d 1292, 1298 (Fed. Cir. 2015) (“The PTO should also consult the patent’s prosecution history in proceedings in which the patent has been brought back to the agency for a second review.”). Accordingly, we maintain our construction of “ambient air” to mean “air surrounding the canister.”

#### *Canister*

A dictionary definition of “canister” is “[a] small box or case for holding tea, coffee, etc.” WEBSTER’S NEW COLLEGIATE DICTIONARY, 121



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(2d ed. 1951) (Ex. 3001). The canister component of the vacuum cleaning machine described in the '640 patent holds filters and particles filtered by the filters that may settle to the bottom of the canister. Ex. 1001, 3:30–31, 4:50–54. At oral hearing, Patent Owner stated “I believe we chose the word cannister because we are talking about a small unit,” but added “[a]nd I’m not saying this is a distinction.” Tr. 42:12–13, 16. According to Patent Owner, the term is “a common word for this now” as opposed to being uniquely defined by the Specification. *Id.* at 42:24–25. Patent Owner summarized the generic manner in which the term is used in the '640 patent as: “We are saying, okay, it doesn’t matter. It’s cannister, a cabinet, a compartment. They are all some form of container.” Tr. 42:25–43:2.

Petitioner implicitly construes this term as a “chamber” and not limited to a particular configuration. Pet. Reply 2–5. Petitioner asserts that there is no disavowal in the Specification of configurations for the canister. *Id.* at 3. In further support of its position, Petitioner quotes the testimony of Mr. Grant describing the prior art wherein he states “[t]he canister of the vacuum is the part where the filters reside and dust is separated from the incoming vacuumed air and collected.” *Id.* (quoting Ex. 1013 ¶ 10).

Based on the entire record, we determine that the ordinary and customary meaning of the term “canister,” as would be understood by one of ordinary skill in the art in the context of the entire disclosure, is “a container.” *See Translogic*, 504 F.3d at 1257.

#### *Pneumatic Communication*

The term “pneumatic communication” is recited in claims 1 and 10 to describe the relationship between one filter and “a corresponding one of each of said outlet ports, a vacuum source, . . . valves disposed outside of

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said cannister.” Ex. 1001, 8:6–9, 8:62–65. It is also recited in claims 1 and 10 to describe the relationship between “each valve” and the “vacuum source and a corresponding one of each of said outlet ports.” *Id.* at 8:9–11, 8:65–67. Each claim further recites “permitting air to be drawn by said vacuum source from said inlet port simultaneously through corresponding ones of said filters.” *Id.* at 8:11–13, 8:67–9:2. As construed above, the term “drawn” means “pulled in by negative pressure.” *See supra* Section II.B. Through their assertions concerning the applicability of the prior art, Patent Owner asserts that a particular structure, such as a duct, is required to achieve air being pulled in by negative pressure through a filter by a vacuum source. There is no evidence presented to us in this record that supports Patent Owner’s assertion. Both the context of the claims and the Specification suggest that “pneumatic communication” is used broadly to refer to the relative positioning of the vacuum source, filters, and ports such that the air is drawn through the filters. Neither the claims nor the Specification use the term “duct” or any particular connective structure when describing air flow as “pneumatic communication.” *See, e.g.*, Ex. 1001, 1:62–2:8. In comparison, a “duct” is identified in the Specification as redirecting air flow from the inlet port to reduce recycling particles through the filters. *See, e.g.*, Ex. 1001, 2:52–61. Therefore, we construe the term “pneumatic communication” as not limited to a “duct.”

### *C. Patentability of Claims*

To prevail in its challenges to the patentability of claims, the Petitioner must establish facts supporting its challenges by a preponderance of the evidence. 35 U.S.C. § 316(e); 37 C.F.R. § 42.1(d). A claim is anticipated, and, thus, unpatentable, if a single prior art reference discloses

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each and every element of the claimed invention. *See Schering Corp. v. Geneva Pharm.*, 339 F.3d 1373, 1377 (Fed. Cir. 2003). A claim is obvious, and, thus, unpatentable, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art. 35 U.S.C. § 103(a).

We analyze the instituted grounds of unpatentability in accordance with the above-stated principles.

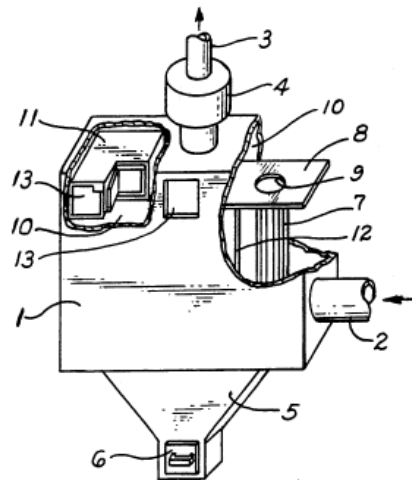
*D. Anticipation of Claims 1 and 10 by Hayden*

With respect to the alleged ground of unpatentability based on anticipation by Hayden, we have reviewed the Petition, the Patent Owner Response, and Petitioner's Reply, as well as the relevant evidence discussed in each of those papers. We are persuaded, by a preponderance of the evidence, that claims 1 and 10 are anticipated by Hayden under 35 U.S.C. § 102(b).

*1. Overview of Hayden (Ex. 1003)*

Hayden describes a dust collector that filters dirty air and periodically backflushes the filtration elements by sucking atmospheric air backwards through the filtration elements. Ex. 1003, Abstr. A diverter valve switches between normal usage and the backflush. *Id.* Figure 1 below is a perspective view of the dust collector of Hayden with the cabinet cut away to show diverter valve 11 (with air inlet port 13) on the left and separator plate 8, on the right, that separates clean air chamber 10 from the dirty air below. *Id.* at 2:64–67; 3:32–45; 3:52–55.

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**Fig. 1**

Figure 1 above also shows outlet holes 9 in plate 8 for each filter 7 and that diverter valve 11 rests on separator plate 8. *Id.* at 3:40–45. The Hayden reference was considered the closest prior art to the '640 patent claims by the Examiner during prosecution. Ex. 1002, 17. However, the Examiner did not reject any of the claims based on Hayden. As stated in the Reasons for Allowance, the Examiner found that “Hayden has the valves located inside the canister and the canister has only a single outlet.” *Id.*

## 2. Comparison of Hayden with Claims 1 and 10

Referring to Figure 1 of Hayden and claim 1 of the '640 patent, Petitioner identifies the presence of every claim limitation in Hayden's vacuum cleaning machine. Pet. 26–36. According to Petitioner, the canister required by claim 1 corresponds to Hayden's “dirty air chamber below plate 8 in which the filters 7 are located.” *Id.* at 26 (citing Ex. 1003, 3:34–37). Petitioner further identifies on Hayden's canister portion inlet port 2 and multiple outlet ports 9 (one for each of the plurality of filters 7). *Id.* at 26–27 (citing Ex. 1003, 3:34–37, 3:43–49). Petitioner asserts Hayden discloses at least two filters 7 disposed inside the canister, each one in pneumatic

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communication through a corresponding outlet hole or port 9. *Id.* at 27 (citing Ex. 1003, 3:43–49, 4:67–5:23). Petitioner contends the required vacuum source corresponds to suction blower 4 of Hayden “which sucks dirty air from the source and causes the flow through filter 7.” *Id.* (quoting Ex. 1003, 55–58). The required valves disposed outside of the canister correspond to each “diverter valve 11 [which] rests on divider plate 8 directly over filter outlet hole Item 9.” *Id.* (quoting Ex. 1003, 3:40–45).

Regarding each valve “being in pneumatic communication between said vacuum source and a corresponding one of each of said outlet ports,” as recited in claim 1, Petitioner quotes Hayden’s disclosure that the valve chamber is “open on the bottom to receive clean filtered air from filter outlet hole 9 over which the diverter valve 11 sits. Valve chambers 31 [not numbered in Figure 1] thus lie in the air flow path between the dirty air chamber and clean air chamber 10.” *Id.* at 27–28 (quoting Ex. 1003, 4:26–31). The recited “means for sequentially operating said valves to switch said filters from connection to said vacuum source to connection to ambient air” in claim 1 is identified in Hayden by Petitioner as the comparison between Hayden’s Figures 4 and 6, as well as Hayden’s disclosures of a backflushing operation, which switches the valve between an open and a closed position that effectively alternates between ports and a backflushing and a non-backflushing position. *Id.* at 28–29 (citing Ex. 1003, Figs. 4, 6, 2:28–51, 4:32–66, 5:12–15, 6:1–6). As shown by Petitioner, the backflushing position of the valve “block[s] communication between valve chamber 31 and the clean air chamber 10, and open[s] valve chamber 31 to the ambient air port 13.” *Id.* at 32 (citing Ex. 1003, Figs. 3, 4, 6; Ex. 1013 ¶¶ 18, 19).

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As for the additional structural limitations recited in claim 10, namely “three outlet ports,” “three filters, and “three valves,” Petitioner identifies Hayden’s disclosure of a “dozen or so” filters as encompassing at least three filters and further states that each filter in Hayden is associated with an outlet port 9 through filter plate 8 and into valve chamber 31 and diverter valve 11. *Id.* at 30 (citing Ex. 1003, Fig. 1, 2:52–56, 3:43–49).

Patent Owner challenges the evidence of anticipation of claims 1 and 10 by Hayden on the basis that Hayden’s “canister” is not “the dirty air chamber” as identified by Petitioner. PO Resp. 3. Instead, Patent Owner asserts that Hayden’s “canister” is “divided by a plate into an upper negative pressure clean air chamber and a lower dirty air chamber.” *Id.* As such, Patent Owner argues that Hayden’s valves 11 are inside the canister instead of outside the canister as required by claims 1 and 10. *Id.* at 3–4, 12–13. Patent Owner points to the prosecution history of the ’640 patent in support of its argument, in which the Examiner determined that Hayden has its valves 11 inside the canister, instead of outside the canister as required by claim 1 and 10. *Id.* at 20 n.7 (citing Ex. 1002, 17).

Patent Owner argues that its claimed canister “has only a single chamber” and therefore “do[es] not correspond” to “Hayden’s two chamber canister.” *Id.* at 21–22. Patent Owner further distinguishes Hayden from the claimed invention on the basis that “Hayden’s ports 9 open into valves 11 which are inside the negative pressure clean air chamber 10 while Patent Owner’s outlet ports 11, 12, 13 open into valves 31, 32, 33 which are in ambient air 16.” *Id.* at 22 (emphasis omitted). Patent Owner asserts that because Hayden draws atmospheric air from outside of chamber 10 into

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valve 11, Hayden's valves are "not in ambient air outside of the canister."  
*Id.* at 24.

Patent Owner also argues that Hayden's valves 11 are not in pneumatic communication between the vacuum source 4 and outlet ports 9 because "Hayden's common negative pressure chamber 10 is common to all of Hayden's valves 11 and access to the suction blower 4 is had only by communication through the common negative pressure clean air chamber 10." *Id.* at 23. Patent Owner asserts the claimed invention "has no clean air chamber and Patent Owner's vacuum source 15 is always connected to the valves 31, 32, 33." *Id.* at 24.

Based on the preponderance of the evidence in this record, we are persuaded the '640 patent claims read on Hayden's embodiment shown in Figure 1. We find the scope of the '640 patent claims is broader than the distinctions Patent Owner argues to differentiate the teachings of Hayden. Patent Owner's arguments focus on particular embodiments disclosed in the '640 patent, but the '640 patent claims are not so limited. For example, Patent Owner contends that Hayden's dirty air chamber cannot correspond to a canister because "in order to access ambient air, Hayden must extend a duct from each of the valves 11 through the negative pressure clean air chamber 10 to ambient air outside of the chamber 10." *Id.* at 21. Patent Owner concludes that because the canister depicted in the '640 patent as item 10 and 19 has a single chamber, "Hayden's two chamber canister and Patent Owner's single chamber canister 10, 19 do not correspond." *Id.* at 21–22 (emphasis omitted). We are not persuaded.

Similarly, Patent Owner contends that Hayden's diverter valves 11 do not correspond to the claimed valves because they are situated differently

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from valves 31, 32, and 33 in the '640 patent. Specifically, Patent Owner contends that "Patent Owner's vacuum source 15 is connected to each valve 31, 32, 33, not to a negative pressure chamber 10" while "Hayden's clean air chamber 10 is a negative pressure chamber common to and encasing all the 'outlet' ports 9 and valves 11." *Id.* at 22 (emphasis omitted). Patent Owner's arguments are unpersuasive because limitations not appearing in the claims cannot be relied upon for patentability. *In re Self*, 671 F.2d 1344, 1348 (CCPA 1982).

We are not persuaded by Patent Owner's arguments because neither the '640 patent claims nor the teachings of Hayden preclude reading the term "canister," as construed herein, on Hayden's "dirty air chamber below plate 8 in which the filters 7 are located." *See* Pet. 26 (citing Ex. 1003, Fig. 1). The '640 patent itself describes such an embodiment in which the canister component is located under a plate. Ex. 1001, 4:59–61 ("A central housing 44 is preferably concentrically located on top of the circular plate 19 covering the cannister 10."). In other words, Patent Owner's plate 19 covers canister 10 just as Hayden's plate 8 covers Hayden's canister. As such, we find that Hayden discloses "at least two valves disposed outside of said cannister" and "three valves disposed outside of said cannister" as recited in claims 1 and 10, respectively.

We also find no limitation in the '640 patent claims that would preclude a common chamber between the valves and the vacuum source. No specific connective structure between the valves and the vacuum source is required by "each said valve being in pneumatic communication between said vacuum source and a corresponding one of each of said outlet ports and permitting air to be drawn by said vacuum source from said inlet port



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simultaneously through corresponding ones of said filters,” as recited in claims 1 and 10. Referring to Figure 1 of Hayden, correspondence exists between each valve 11, outlet port 9, and filter 7. Ex. 1003, Fig. 1, 3:40–45. In addition, there is pneumatic communication between these elements of Hayden due to an “air flow path between the dirty air chamber and clean air chamber 10” in which valve chamber 31 lies. *Id.* at 4:26–31. Furthermore, independent claims 1 and 10 each use the term “comprising,” signaling an open-ended structure, allowing for the inclusion of a common chamber.

Regarding the prosecution history, we are persuaded by Petitioner that the Examiner overlooked Hayden’s description of divider plate 8 separating the dust collector into a dirty air chamber (not numbered) and a clean air chamber 10. *See* Pet. 35. We are unpersuaded by Patent Owner that Hayden does not disclose the claimed “cannister,” the claimed “valves disposed out of said cannister,” and the claimed “connection to ambient air” recited in claims 1 and 10. The broadest reasonable interpretations of “cannister” and “ambient air” do not require the sort of structural connections between the vacuum and the valves and between the valves and the ambient air that Patent Owner proposes we read into the claims from Figures 1 and 2 in the ’640 patent showing canister 10, 19 and valves 31, 32, and 33. Indeed, Figures 1 and 2 of the ’640 patent omit any particular ducts by which ambient air is carried, including in the region above plate 19 and under cover 25 shown in Figure 2.

Nor do we incorporate any particular structural connections between the components of the claimed vacuum cleaning machine through the term “pneumatic communication” recited in claims 1 and 10. When asked about “pneumatic communication” at oral hearing, Patent Owner stated that it

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refers to the pattern of flow dictated by how the claim tells you to put the parts together to create a backflow situation in a vacuum cleaning machine. *See* Tr. 32:14–33:4. Patent Owner asserts that the flow patterns are different between the claimed machine and Hayden, and illustrates this difference in diagrams. PO Resp. 5–21 (citing Ex. 2005 ('640 patent diagrams), Ex. 2006 (Hayden diagrams)). Any differences in the flow patterns drawn as colored arrows by Patent Owner in Exhibits 2005 and 2006, however, are not due to the omission of an element recited in claim 1 or 10. *Compare* Ex. 2005, diagrams 5 and 6, *with* Ex. 2006, diagrams 9 and 12.

Patent Owner does not dispute that the Hayden device creates a backflow situation. Nor does Patent Owner dispute that gas flow in Hayden's device is through Hayden's valve between a vacuum source and an outlet port to draw air through a corresponding filter. Patent Owner also does not dispute that Hayden's valve is switched from the vacuum source to air from outside of the machine such that the air flows through the valve and filters to create a backflush situation. In Exhibit 2006, Patent Owner draws a box to indicate Hayden's clean air chamber 10 is above the unnumbered dirty air chamber contained by divider plate 8, and omits from Exhibit 2005 any reference to the '640 patent's disclosure of cover 25 above canister 10, 19. The only difference between the arrows drawn by Patent Owner in Exhibits 2005 and 2006 is with respect to the regions above plates 19 (of the '640 patent) and 8 (of Hayden) outside of their filter-containing compartments. Patent Owner shows the gas drawn through the valves by a negative pressure vacuum source as coming together either in what appears to be a common duct for the invention (Ex. 2005, diagram 5) or clean air chamber 10 of Hayden (Ex. 2006, diagram 9). During the backflush

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operation, Patent Owner shows the switch to ambient air being pulled through the valves as coming from outside of the machine in both the invention and Hayden. Ex. 2005, diagram 6; Ex. 2006, diagram 12. Thus, the only difference between the invention and Hayden's machine suggested by Patent Owner's diagrams is in the suggested ductwork above the plates and valves. Claims 1 and 10 do not require any particular ductwork, connector, or path (1) for the negative pressure vacuum source after it draws air through the valve or (2) for the ambient air source to reach the valves. Therefore, we do not find persuasive Patent Owner's attorney arguments presented as diagrams in Exhibits 2005 and 2006.

The preponderance of the evidence on the complete record after trial shows that Hayden's dust collector with atmospheric backflush anticipates claims 1 and 10 for the reasons provided by Petitioner and as articulated herein. Pet. 26–36; Pet. Reply 1–17.

*E. Obviousness of Claims 1, 4–6, 10, and 13–15  
Over Hayden and Wellan*

Regarding claims 1 and 10, Petitioner asserts that, to the extent that the term “means for sequentially operating” also requires timing features from a controller, rather than just the solenoids controlled by the controller, Wellan's controller is equivalent to the structure in the '640 patent's electronic embodiment. Pet. 39. Wellan's electronic controller includes a timer that has inputs for adjusting the frequency and length of time at which a stepping switch moves between connections to the various individual solenoids for valves 38. *Id.* at 41 (citing Ex. 1004, Fig. 7; 5:52–60; 7:42–47; 7:58–61). Petitioner's rationale for selecting Wellan's controller, for Hayden's device, is based on Hayden's disclosure that its cleaning cycle

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controller provides for automatic, periodic cleaning cycles to keep the dust-making equipment in continuous operation and “[i]t is considered within the capacity of those skilled in the art to construct cleaning cycle controller 25.” *Id.* at 40 (quoting Ex. 1003, 4:60–66). Therefore, Petitioner asserts that one of ordinary skill in the art, looking for an appropriate controller with which to construct the Hayden device, would have included the known controller that Wellan discloses for actuating solenoids in a vacuum cleaning machine. *Id.*

Regarding claims 4–6 and 13–15, Petitioner asserts that the electronic controller of Wellan is equivalent to the electronic controller of the ’640 patent, and that Wellan’s electronic controller sets the intermittent time that the valve is switched to ambient air in the same manner as the backflush timer 103 in the ’640 patent. *Id.* at 44 (citing Ex. 1001, 6:40–50; 7:1–6; Ex. 1004, 5:52–59; 7:42–47). Similarly, Petitioner asserts that Wellan’s electronic controller is equivalent to the controller of the ’640 patent, because both controllers turn the solenoid valves on and off individually, and therefore set a cycle time of periods when the solenoids are energized (on) and de-energized (off). *Id.* at 46–47 (citing Ex. 1001, 6:8–11, 6:17–33; Ex. 1004, 5:55–59). Accordingly, Petitioner asserts that the combination of Wellan’s controller with Hayden’s device meets the “means for setting said intermittent time” recited in claims 5, 6, 14, and 15 and the “means for setting a cycle time” recited in claims 4, 6, 13, and 15. *Id.* at 45–46, 47–48.

Patent Owner asserts that obviousness over the combination of Hayden and Wellan is moot because Hayden does not disclose every element of claims 1 and 10 for the reasons discussed above. PO Resp. 30–31.

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For the reasons provided in the Petition and above, we are persuaded that Hayden discloses the elements recited in claims 1 and 10. Based on the trial record, Hayden suggests the use of known controllers, such as that disclosed in Wellan, for sequentially operating valves in vacuum cleaning devices. Petitioner also has shown adequately how the controller in Wellan is equivalent to the controller in the '640 patent to meet the “means for setting a cycle time” and the “means for setting said intermittent time” limitations required by dependent claims 4–6 and 13–15. Therefore, the preponderance of the evidence demonstrates that substituting controller 25 in Hayden’s device with Wellan’s controller would have been obvious as a predictable variation in the same field. Accordingly, claims 1, 4–6, 10, and 13–15 would have been obvious in view of Hayden and Wellan for the reasons provided by Petitioner. *See* Pet. 39–48; Pet. Reply 17.

*F. Obviousness of Claims 7–9 and 16–18  
Over Hayden, DE219, and Howeth*

After considering Petitioner’s and Patent Owner’s positions as to claims 7–9 and 16–18, as well as their supporting evidence, we determine that Petitioner has shown by a preponderance of the evidence that those claims are unpatentable under 35 U.S.C. § 103(a) as obvious over the combination of Hayden, DE219, and Howeth, and, for claims 9 and 18, further in view of Wellan.

Petitioner asserts that DE219 teaches a piston reciprocally disposed between two ports, as required by claims 7 and 16, and that such a valve is interchangeable with other valve arrangements, including the flap valve type taught by Hayden. Pet. 50 (citing Ex. 1008, Figs. 1, 2, ¶¶ 16, 20–45). Petitioner asserts that the valve arrangement in DE219 includes rods that

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move linearly back and forth under the control of electromagnets, as in a solenoid. *Id.* Petitioner asserts further that the recited “means biasing said piston” to simultaneously (1) close one of said two ports and (2) open another of said two ports, corresponds to a spring in the ’640 patent. Petitioner asserts additionally that Howeth teaches such a spring in the context of an ambient air backflushed vacuum device. *Id.* at 51 (citing Ex. 1007, Figs. 9, 10, 13:39–16:37, 14:14). Regarding claims 8 and 17, which depend from claims 1 and 16, respectively, Petitioner asserts that the required “means for overcoming said bias” corresponds to a solenoid for each valve in the ’640 patent, and that a solenoid is present in Hayden. *Id.* at 52.

Claims 9 and 18 depend from claims 8 and 17, respectively, and require “said bias overcoming means comprising at least two solenoids, one corresponding to each said valve, and means for energizing said solenoids to switch said valves to connect said filters to ambient air and for de-energizing said solenoids to switch said valves to connect said filters to said vacuum source.” Petitioner cites portions of Hayden, which apply electricity to actuate its electrical solenoids, as corresponding to these claim limitations. *Id.* at 52–53. To the extent that the claims require an actual switch to actuate each solenoid, Petitioner further asserts that Wellan teaches that such switches for energizing and de-energizing solenoids would have been predictable and obvious in a vacuum device. *Id.* at 54 (citing Ex. 1004, Fig. 7; Ex. 1013 ¶¶ 25, 36–37).

Patent Owner asserts that Petitioner’s obviousness challenges over the combination of Hayden, DE219, and Howeth (and further in view of

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Wellan) all are moot because Hayden does not disclose every element of claims 1 and 10 for the reasons discussed above. PO Resp. 31–32.

Based on the trial record, we are persuaded that the combination of DE219, Howeth, and Wellan teach the interchangeability with a flap valve of a piston reciprocally disposed between two ports, and the known, predictable use of a spring for biasing a piston and a switch for energizing and de-energizing an electrical solenoid. We also are persuaded that use of the combination of an alternate valve arrangement and alternate solenoid is nothing “more than the predictable use of prior art elements according to their established functions.” *KSR Int’l Co. v. Teleflex Inc.*, 550 U.S. 398, 417 (2007). Therefore, for the reasons provided in the Petition and for the reasons articulated herein, claims 7–9 and 16–18 would have been obvious over Hayden, DE219, and Howeth. Pet. 49–54. For the same reasons, we also are persuaded that the preponderance of the evidence demonstrates that claims 9 and 18 would have been obvious over Hayden, DE219, and Howeth in further view of Wellan. *See id.* at 54.

*G. Obviousness of Claims 2, 3, 11, and 12  
Over Hayden and Von Stackelberg*

With respect to the asserted obviousness over the combination of Hayden and von Stackelberg, we have reviewed the Petition, the Patent Owner Response, and Petitioner’s Reply, as well as the relevant evidence discussed in each of those papers. We are persuaded that the preponderance of the evidence demonstrates that claims 2, 3, 11, and 12 would have been obvious over Hayden in view of von Stackelberg under § 103(a).

Petitioner asserts that von Stackelberg teaches a hose and conduit that directs air downward from an inlet port, as well as a baffle to modify air

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flow “to prevent filters and outlets from becoming clogged from foreign particulates.” Pet. 58 (citing Ex. 1010, Fig. 2, 4:35–54). Petitioner contends that one of ordinary skill in the art would have combined von Stackelberg’s conduit and baffle with Hayden’s canister, because the references teach “the benefits of preventing filters and outlets from becoming clogged from foreign particulates,” and the proffered combination would “maximize the efficacy of the vacuum” and “minimize the debris on a vacuum’s filter.” *Id.* at 58–59. Petitioner further contends that the combination meets the requirements of dependent claims 2 and 11, which require a duct and baffle or equivalents thereof as the “means cooperable with said inlet port” (*id.* at 57–58; Ex. 1001, 8:22, 9:11), and also meets the requirements of dependent claims 3 and 12, which additionally recite that the inlet be positioned “below said filter and above a bottom of said cannister” (Pet. 59; Ex. 1001, 8:26–27, 9:15–16).

Patent Owner argues that the combination of Hayden and von Stackelberg is improper because the purpose of von Stackelberg’s duct and baffle is “preventing filters and outlets from becoming clogged from foreign particles” whereas the purpose of Patent Owner’s duct and baffle “is to allow particles backflushed from the filters 21, 22, 23 to settle to the bottom 24 of canister 10 so as to prevent recycling of the backflushed particles.” PO Resp. 33. Patent Owner further argues that the combination of Hayden, in view of von Stackelberg, is improper because the inlet taught by von Stackelberg comes in from the top, not the side, such that it does not create an upper high velocity zone and a lower low velocity zone, and it also does not teach a filter. *Id.* at 34–35. Patent Owner also argues that Hayden requires shields; therefore the location and purpose of von Stackelberg’s



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structure would be “inconsistent with and destructive of the flow paths Hayden seeks to achieve.” *Id.* at 34.

We are unpersuaded by Patent Owner’s arguments, because the trial record establishes that the duct and baffle arrangement in both the combination and the challenged claims would allow particles to settle to the bottom of the canister and minimize entrainment of particles in an upper portion of the canister, where the air exits through the filters. *See* Pet. 58–59 (citing Ex. 1010, 4:35–65); Ex. 1010, 5:13–14 (providing “passage and release of debris into the drum”), 4:64–65 (inlet port “less likely to be blocked by bulky debris”); Ex. 1001, 4:52–53 (“the particles settle to the bottom of the cannister”); Ex. 1015 ¶¶ 14–16. In addition, Hayden teaches a dust collector having an inlet on the side and filters within a canister. *See* Pet. Reply 21–22; Ex. 1003, Fig. 1. Therefore, Petitioner has provided an adequate rationale for modifying the air inlet in Hayden’s canister with von Stackelberg’s duct and baffle structure. We also agree with Petitioner that Hayden’s disclosure of shields is an optional preferred embodiment and does not preclude modification of the inlet port with von Stackelberg’s duct and baffle. *See* Pet. Reply 20–21 (citing Ex. 1003, 2:20–25). As such, we find the combination is proper and that claims 2, 3, 11, and 12 would have been obvious over the combination of Hayden and von Stackelberg for the reasons provided by Petitioner and as discussed herein. *See* Pet. 20–21; Pet. Reply 17–24.

### III. CONCLUSION

Petitioner has demonstrated by a preponderance of the evidence that (1) claims 1 and 10 are anticipated by Hayden; (2) claims 1, 4–6, 10, and

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13–15 would have been obvious over Hayden and Wellan; (3) claims 7–9 and 16–18 would have been obvious over Hayden, D219, and Howeth; (4) claims 9 and 18 would have been obvious over Hayden, D219, Howeth, and Wellan; and (5) claims 2, 3, 11, and 12 would have been obvious over Hayden and von Stackelberg.

This is a final written decision of the Board under 35 U.S.C. § 318(a). Parties to the proceeding seeking judicial review of this decision must comply with the notice and service requirements of 37 C.F.R. § 90.2.

#### IV. ORDER

Accordingly, it is hereby:

ORDERED that, as set forth in Section III above, claims 1–18 of the '640 patent have been shown to be unpatentable.

FURTHER ORDERED that the parties to the proceeding seeking judicial review of this Final Written Decision must comply with the notice and service requirements of 37 C.F.R. § 90.2.

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PETITIONER:

Jack S. Barufka

Bryan P. Collins

PILLSBURY WINTHROP SHAW PITTMAN LLP

[Jack.barufka@pillsburylaw.com](mailto:Jack.barufka@pillsburylaw.com)

[Bryan.collins@pillsburylaw.com](mailto:Bryan.collins@pillsburylaw.com)

[docket\\_ip@pillsburylaw.com](mailto:docket_ip@pillsburylaw.com)

PATENT OWNER:

Frank J. Catalano

Paul E. Rossler

GABLE & GOTWALS, P.C.

[iplaw@gablelaw.com](mailto:iplaw@gablelaw.com)

[prossler@gablelaw.com](mailto:prossler@gablelaw.com)

[Trials@uspto.gov](mailto:Trials@uspto.gov)  
571-272-7822

Paper 23  
Entered: June 17, 2016

UNITED STATES PATENT AND TRADEMARK OFFICE

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BEFORE THE PATENT TRIAL AND APPEAL BOARD

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BLACK & DECKER (U.S.) INC. and  
STANLEY BLACK & DECKER, INC.,  
Petitioner,

v.

CHRISTY, INC.,  
Patent Owner.

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Case IPR2015-00472  
Patent 7,082,640 B2

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Before MICHAEL W. KIM, DONNA M. PRAISS, and  
KRISTINA M. KALAN, *Administrative Patent Judges*.

PRAISS, *Administrative Patent Judge*.

FINAL WRITTEN DECISION  
35 U.S.C. § 318(a) and 37 C.F.R. § 42.73

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## I. BACKGROUND

Black & Decker (U.S.) Inc. and Stanley Black & Decker, Inc. (collectively, “Petitioner”) filed a Petition (Paper 1, “Pet.”) to institute an *inter partes* review of claims 1, 4–10, and 13–18 (the “challenged claims”) of U.S. Patent No. 7,082,640 B2 (Ex. 1001, “the ’640 patent”) pursuant to 35 U.S.C. §§ 311–319. Paper 1 (“Pet.”). A Preliminary Response was filed by Christy, Inc. (“Patent Owner”). Paper 11 (“Prelim. Resp.”). The Board granted the Petition as to certain grounds and instituted trial. Paper 12 (“Dec. on Inst.”). Although Petitioner proposed seven grounds of unpatentability, the panel instituted trial only on the following four grounds:<sup>1</sup>

- (1) Claims 1 and 10 as anticipated under 35 U.S.C. § 102(b) by Eiben;
- (2) Claims 1, 4–6, 10, and 13–15 as obvious under 35 U.S.C. § 103(a) over Eiben and Wellan;
- (3) Claims 7–9 and 16–18 as obvious under 35 U.S.C. § 103(a) over Eiben, DE219, and Howeth; and
- (4) Claims 9 and 18 as obvious under 35 U.S.C. § 103(a) over Eiben, DE219, Howeth, and Wellan.

*Id.* at 19–20.

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<sup>1</sup> US Patent No. 3,224,172, Dec. 21, 1965 (Ex. 1003) (“Eiben”); US Patent No. 3,680,285, Aug. 1, 1972 (Ex. 1004) (“Wellan”); DE 101 01 219 A1, July 25, 2002 (Ex. 1006; Ex. 1008 (translation)) (“DE219”) (citations herein are to the translation, Ex. 1008); and US Patent No. 4,465,497, Aug. 14, 1984 (Ex. 1007) (“Howeth”).

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During trial, Patent Owner filed a Patent Owner Response.<sup>2</sup> Paper 15 (“PO Resp.”). Petitioner filed a Reply to Patent Owner’s Response relying on the Declaration of Jeffrey P. Grant (Ex. 1010). Paper 16 (“Pet. Reply”).

An oral hearing was held on March 22, 2016, and a transcript of the hearing is included in the record. Paper 22 (“Tr.”).

We have jurisdiction under 35 U.S.C. § 6(c). This final written decision is issued pursuant to 35 U.S.C. § 318(a) and 37 C.F.R. § 42.73. For the reasons that follow, we determine that Petitioner has met its burden to prove by a preponderance of the evidence that claims 1, 4–10, and 13–18 of the ’640 patent are unpatentable.

*A. Related Proceedings*

The ’640 patent is the subject of *CDC Larue Indus., Inc. v. Black & Decker Corp.*, Civil Action No. 4:2014-cv-00286 (N.D. Okla.). Pet. 1; Paper 10, 2. It is also the subject of concurrently-filed *inter partes* review proceeding IPR2015-00468.

*B. The ’640 Patent (Ex. 1001)*

The ’640 patent, titled “Ambient Air Backflushed Filter Vacuum,” is directed to a filtered vacuum system in which dust is cleaned from the filters with backflushed ambient air. Ex. 1001, 1:6–8. The device comprises a

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<sup>2</sup> Patent Owner lists the Declaration of David L. McCutchen (Ex. 2001) in the list of exhibits on page iii of Patent Owner’s Response without citing or relying on it in Patent Owner’s Response. *See generally* PO Resp. Incorporation of arguments from one document into another document by reference is not permitted; arguments not raised in the response itself are deemed waived. 37 C.F.R. § 42.6(a)(3); Paper 13 (Scheduling Order), 3. Therefore, we give no weight to the Declaration of David L. McCutchen for purposes of this Decision.

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canister<sup>3</sup> having at least two filters, an inlet port, and at least two outlet ports that are in pneumatic communication with each of the filters. *Id.* at Abstr. At least two valves are disposed outside of the canister, each in pneumatic communication between a vacuum source and an outlet port so as to permit air to be drawn through the filters. *Id.* The valves are operated by a controller, which switches “the filters from the vacuum source to ambient air so as to permit ambient air to be sequentially intermittently drawn through corresponding valves and filters.” *Id.* Figure 1 below is a block diagram of the ambient air backflushed filter vacuum system. *Id.* at 3:1–2.

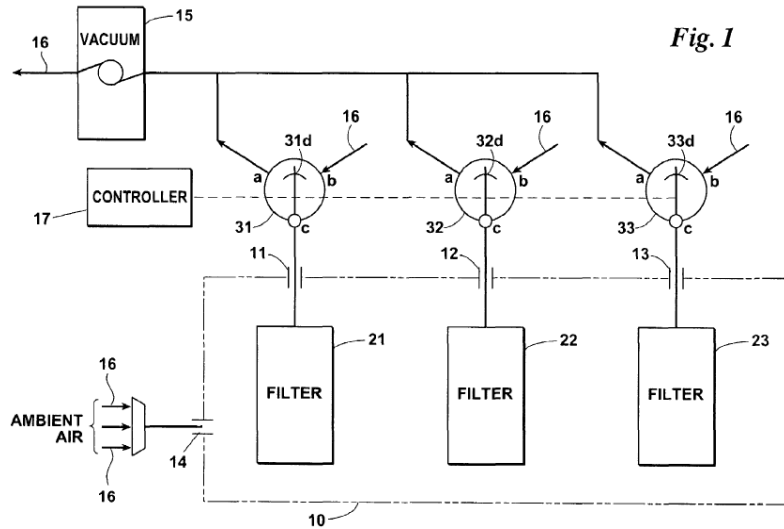


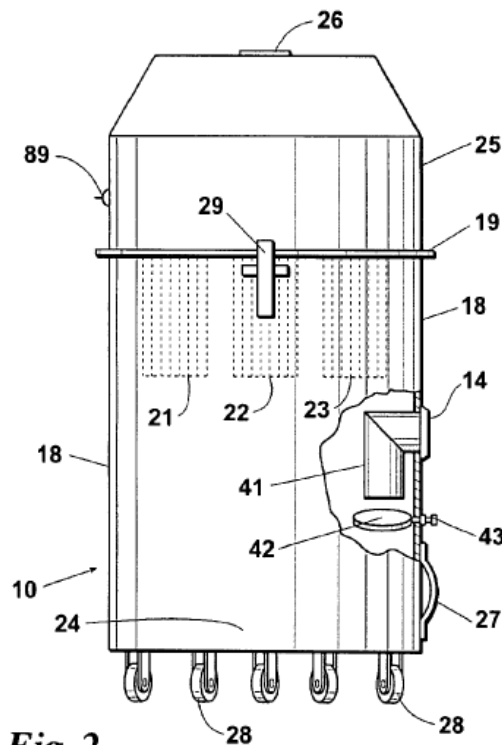
Figure 1 shows multiple filters 21, 22, 23 in canister 10 having inlet port 14 through which ambient air 16 flows, and outlet ports 11, 12, 13 through which the filters are in pneumatic communication with vacuum source 15. *Id.* at 3:29–31, 46–48. Controller 17 causes valves 31, 32, 33 disposed outside of canister 10 to switch between an open position “a” to vacuum

<sup>3</sup> The '640 patent uses the spelling “cannister.” See Ex. 1001, *passim*. We use the common spelling “canister” for purposes of this decision.

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source 15 and a closed position “b” that draws in ambient air 16 to filters 21, 22, 23. *Id.* at 3:28–48.

Figure 2 below is a side elevation of the ambient air backflushed filter vacuum. *Id.* at 3:3–4.



**Fig. 2**

Figure 2 shows cylindrical canister 10 topped with plate 19. Filters 21, 22, 23 are mounted to the bottom of plate 19 and pneumatically communicate through outlet ports in plate 19 to vacuum source 15 (not shown) mounted above plate 19. Vacuum source 15 is protected by cover 25 seated on plate 19 and secured with latches 29. *Id.* at 4:13–34. Opening 26 in cover 25 exhausts air discharged from vacuum source 15. *Id.* at 4:26–27. Inlet port 14 is shown with duct 41 extending below filters 21, 22, 23. Baffle 42 is positioned below the outlet end of duct 41 to redirect air flow such that (1) there is little turbulence below baffle 42 and (2) particles that settle to



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bottom 24 of canister 10 are less likely to be recycled through filters 21, 22, 23. *Id.* at 4:35–54.

*C. Illustrative Claim*

Claims 1 and 10 of the ‘640 patent are the only independent claims at issue. Claim 1, reproduced below, is illustrative of the claimed subject matter:

1. A vacuum cleaning machine comprising  
a cannister having an inlet port and at least two outlet ports,  
at least two filters disposed inside of said cannister, one in  
pneumatic communication through a corresponding one of each  
of said outlet ports,  
a vacuum source,  
at least two valves disposed outside of said cannister, each said  
valve being in pneumatic communication between said vacuum  
source and a corresponding one of each of said outlet ports and  
permitting air to be drawn by said vacuum source from said  
inlet port simultaneously through corresponding ones of said  
filters and  
means for sequentially operating said valves to switch said  
filters from connection to said vacuum source to connection to  
ambient air and permitting ambient air to be drawn through  
corresponding ones of said valves and said filters which are  
connected to ambient air by said vacuum via corresponding  
ones of said valves and filters which are connected to said  
vacuum.

Ex. 1001, 8:4–20 (paragraphing added).

II. ANALYSIS

*A. Person of Ordinary Skill in the Art*

Petitioner asserts that the field of the invention is “vacuum cleaning machines” and “[t]he ordinary artisan in that field would typically have a bachelor’s level degree in mechanical engineering (or gained such

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knowledge by equivalent experience), and experience developing vacuum machines that filter air.” Pet. 25 (citing Ex. 1001, 1:6–9; Ex. 1010 ¶ 8). Patent Owner does not dispute Petitioner’s definition of a person of ordinary skill in the art or provide an alternative definition in response. However, Patent Owner characterizes the field of art for the invention as “the art of portable vacuums” while characterizing the field of art for Eiben as “bag house art.” PO Resp. 29.

For purposes of this Decision, we consider the cited prior art as representative of the level of ordinary skill in the art. *See Okajima v. Bourdeau*, 261 F.3d 1350, 1355 (Fed. Cir. 2001) (finding the absence of specific findings on “level of skill in the art does not give rise to reversible error ‘where the prior art itself reflects an appropriate level and a need for testimony is not shown’” (quoting *Litton Indus. Prods., Inc. v. Solid State Sys. Corp.*, 755 F.2d 158, 163 (Fed. Cir. 1985))). To the extent that we need to consider the parties’ positions on the issue, we adopt Petitioner’s position. We find Patent Owner does not indicate why the field of art should be limited to portable vacuums other than by reference to casters 28 in Figure 2 of the ’640 patent which are said to “allow the cannister 10 to be freely rolled in any direction.” *Id.* at 28 (citing Ex. 1001, Fig. 2, 4:22–23).<sup>4</sup> We also find the ’640 patent describes the invention as broadly relating “generally to vacuum cleaning equipment and more particularly concerns a vacuum cleaner having filters backflushed with ambient air.” Ex. 1001, 1:6–9; Pet. 25.

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<sup>4</sup> We understand Patent Owner’s citation to column 4, lines 22 through 23 of the ’640 patent to be a typographical error that should be referencing the description of casters at column 4, lines 29 through 31 instead.

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*B. Claim Interpretation*

In an *inter partes* review, claim terms in an unexpired patent are interpreted according to their broadest reasonable construction in light of the specification of the patent in which they appear. 37 C.F.R. § 42.100(b); *see also In re Cuozzo Speed Techs., LLC*, No. 778 F.3d 1271, 1281 (Fed. Cir. 2015) (“We conclude that Congress implicitly adopted the broadest reasonable interpretation standard in enacting the AIA.”), *cert. granted sub nom. Cuozzo Speed Techs., LLC v. Lee*, 136 S. Ct. 890 (mem.) (2016). Under that standard, claim terms are given their ordinary and customary meaning, as would be understood by one of ordinary skill in the art in the context of the entire disclosure. *In re Translogic Tech., Inc.*, 504 F.3d 1249, 1257 (Fed. Cir. 2007). Also, care is taken not to read a particular embodiment appearing in the written description into the claim if the claim language is broader than the embodiment. *See In re Van Geuns*, 988 F.2d 1181, 1184 (Fed. Cir. 1993) (“limitations are not to be read into the claims from the specification”).

In the Decision on Institution, we interpreted various claim terms of the ’640 patent as shown in the following two tables:

**Table 1 – Claim Terms**

Term	Interpretation
“ambient air”	“air surrounding the canister”
“drawn”	“pulled in by negative pressure”
“piston reciprocally disposed between two said ports”	“piston [] located between the claimed ports of the valve housing, and [that] moves back and forth between the claimed ports”

Dec. on Inst. 6–9.

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**Table 2 – Means-plus-Function Claim Terms**

Term	Function	Structure
Means for sequentially operating	Switching the filters from connection to said vacuum source to connection to ambient air	Solenoid for each valve
Means for setting said intermittent time	Actuating the solenoid after a length of time to switch the valve to ambient air	Cam motor of backflush timer in controller
Means for setting a cycle time	Actuating the solenoid after a length of time to switch the valve to ambient air	Cam motor or delay timer in controller
Means biasing said piston	Acts to bias the piston	Coil spring
Means for over-coming said bias	Overcoming spring bias when sequentially operating the valves	Solenoid for each valve
Means for energizing . . . de-energizing	Opening or closing actuation of switches to energize solenoids	Switches
Means cooperable with said inlet port	Divides canister into an upper zone of high velocity vortex air flow and a lower zone of reduced velocity air flow	Duct and baffle

*Id.* at 9–10.

Patent Owner does not raise any claim construction issues in its Response. *See* PO Resp. 4. Petitioner challenges only our construction for the term “ambient air.” *See* Pet. Reply 19–20. Since “the construction of that term does not appear to have any material impact on this particular proceeding,” Petitioner notes its disagreement “to preserve its rights on this point in the related proceeding” IPR2015-00468. *Id.*

Because we construed “ambient air” in related case number IPR2015-00468 and in our Decision on Institution, and because our construction of the term “ambient air” incorporates the term “canister,” we include a claim construction analysis of the terms “ambient air” and “canister” below. We

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also include below a claim construction for the term “pneumatic communication” because the parties dispute whether this element of the claims is present in the cited prior art. Regarding the remaining terms for which a claim construction was requested, after reconsidering everything anew, we adopt the constructions as stated in Tables 1 and 2 for the reasons stated in our Decision on Institution. Dec. on Inst. 6–10.

*Ambient Air*

Petitioner proposes “ambient air” means “air from the area surrounding the outside of the vacuum cleaning machine that has not been forced or compressed.” Pet. 13. Petitioner asserts this construction is consistent with the Specification, which confirms ambient air is outside the vacuum machine, and that Patent Owner disavowed forced or compressed air from being ambient air during prosecution. *Id.* at 13–14.

The district court found the meaning of “ambient air” was not limited by clear and unmistakable evidence to either (1) air surrounding the outside of the vacuum cleaning machine or (2) air that is not forced or compressed. Opinion and Order, Ex. 2004, 6–14. In our Decision on Institution, we agreed with the district court’s construction and analysis, which is broader than Petitioner’s proposed construction, and found it consistent with the Specification. Dec. on Inst. 7–8. Specifically, Figure 2 of the ’640 patent shows cover 25 “seated on” plate 19 to protect the valves, the operating mechanisms, the controller, and the vacuum source, which are all “mounted above” plate 19. Ex. 1001, 4:22–25. Thus, ambient air coming through the valves may come from the vacuum head under the cover; it need not come exclusively from outside the vacuum machine as Petitioner asserts. There is no evidence in the record whether the ambient air under the cover

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necessarily would have a particular pressure, including whether it is under atmospheric pressure. *See* Tr. 43:13–44:2 (Patent Owner describing ambient air as being “in comparison to what is inside of the cannister”).

During prosecution, Patent Owner distinguished a pulse back cleaning system for multiple reasons, including the reason that the claimed invention “does not flip-flop between vacuuming and blowing.” File Wrapper of U.S. Patent No. 7,082,640 B2, Ex. 1002, 36. Patent Owner also distinguished other prior art for the reason that it “cannot function without a second centrifugal fan and associated components and limitation (e.g., transverse duct and array of parallel ducts)” whereas the invention was described as “valve 31 and filter 21 are not connected to any other fan, compressor or vacuum source.” *Id.* at 59. We agree with the district court that the intrinsic evidence does not present a clear and unmistakable disavowal of the source of ambient air. *Thorner v. Sony Comput. Entm’t Am. LLC*, 669 F.3d 1362, 1366 (Fed. Cir. 2012) (the standard for disavowal of claim scope is “exacting”). Figures 2–5 of the ’640 patent show three ambient air ducts 36 under cover 25. Ex. 1001, Figs. 2–5, 3:1–9, 4:22–27, 5:15–17. As the district court found, “[i]t is not clear from the drawing where that duct terminates, and the detailed description states only that ‘[t]he ambient air duct 36 extends from the ambient air port 31b into the source of ambient air 16.’” Ex. 2004, 12. Similarly, the district court found that the statements in the prosecution history regarding the ambient air also “do not exclude the possibility that ‘ambient air’ could come from inside—or both inside and outside—the vacuum head during backflushing.” *Id.* at 13. Moreover, the distinctions over the prior art included “differences unrelated to the source of the air used for backflushing.” *Id.* Based on the complete trial record,

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including the prosecution history, we agree with the district court's construction of "air surrounding the canister" as the broadest reasonable interpretation of the term "ambient air." *See Microsoft Corp. v. Proxyconn, Inc.*, 789 F.3d 1292, 1298 (Fed. Cir. 2015) ("The PTO should also consult the patent's prosecution history in proceedings in which the patent has been brought back to the agency for a second review."). Accordingly, we maintain our construction of "ambient air" to mean "air surrounding the canister."

#### *Canister*

A dictionary definition of "canister" is "[a] small box or case for holding tea, coffee, etc." WEBSTER'S NEW COLLEGIATE DICTIONARY, 121 (2d ed. 1951) (Ex. 3001). The canister component of the vacuum cleaning machine described in the '640 patent holds filters and particles filtered by the filters that may settle to the bottom of the canister. Ex. 1001, 3:30–31, 4:50–54. At oral hearing, Patent Owner stated "I believe we chose the word cannister because we are talking about a small unit," but added "[a]nd I'm not saying this is a distinction." Tr. 42:12–13, 16. According to Patent Owner, the term is "a common word for this now" as opposed to being uniquely defined by the Specification. *Id.* at 42:24–25. Patent Owner summarized the generic manner in which the term is used in the '640 patent as: "We are saying, okay, it doesn't matter. It's cannister, a cabinet, a compartment. They are all some form of container." Tr. 42:25–43:2.

Petitioner implicitly construes this term as a structure "where the filters reside and dust is separated from the incoming vacuumed air and collected" and not limited to a particular configuration. Pet. Reply 4–5 (quoting Ex. 1010 ¶ 10) (emphasis omitted). Petitioner asserts that there is

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no disavowal in the Specification of configurations for the canister and “[n]othing in the claim language [that] limits the claim scope to a ‘unitary’ or ‘one part’ ‘cannister,’ or excludes a multiple part ‘cannister.’” *Id.* at 4. In further support of its position, Petitioner quotes the testimony of Mr. Grant describing the prior art wherein he states “[t]he canister of the vacuum is the part where the filters reside and dust is separated from the incoming vacuumed air and collected.” *Id.* at 3(quoting Ex. 1013 ¶ 10).

Based on the entire record, we determine that the ordinary and customary meaning of the term “canister,” as would be understood by one of ordinary skill in the art in the context of the entire disclosure, is “a container.” *See Translogic*, 504 F.3d at 1257.

#### *Pneumatic Communication*

The term “pneumatic communication” is recited in claims 1 and 10 to describe the relationship between one filter and “a corresponding one of each of said outlet ports, a vacuum source, . . . valves disposed outside of said cannister.” Ex. 1001, 8:6–9, 8:62–65. It is also recited in claims 1 and 10 to describe the relationship between “each valve” and the “vacuum source and a corresponding one of each of said outlet ports.” *Id.* at 8:9–11, 8:65–67. Each claim further recites “permitting air to be drawn by said vacuum source from said inlet port simultaneously through corresponding ones of said filters.” *Id.* at 8:11–13, 8:67–9:2. As construed above, the term “drawn” means “pulled in by negative pressure.” *See supra*.

Through their assertions concerning the applicability of the prior art, Patent Owner asserts that a particular structure, such as a duct, is required to achieve air being pulled in by negative pressure through a filter by a vacuum source. There is no evidence presented to us in this record that supports



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Patent Owner's assertion. Both the context of the claims and the Specification suggest that "pneumatic communication" is used generally to refer to the relative positioning of the vacuum source, filters, and ports such that the air is drawn through the filters. Neither the claims nor the Specification use the term "duct" or any particular connective structure when describing air flow as "pneumatic communication." *See, e.g.*, Ex. 1001, 1:62–2:8. In comparison, a "duct" is identified in the Specification as redirecting air flow from the inlet port to reduce "recycling particles through the filters." *See, e.g.*, Ex. 1001, 2:52–61. Therefore, we construe the term "pneumatic communication" as not limited to a "duct."

*C. Patentability of Claims*

To prevail in its challenges to the patentability of claims, the Petitioner must establish facts supporting its challenges by a preponderance of the evidence. 35 U.S.C. § 316(e); 37 C.F.R. § 42.1(d). A claim is anticipated, and, thus, unpatentable, if a single prior art reference discloses each and every element of the claimed invention. *See Schering Corp. v. Geneva Pharm.*, 339 F.3d 1373, 1377 (Fed. Cir. 2003). A claim is obvious, and, thus, unpatentable, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art. 35 U.S.C. § 103(a).

We analyze the instituted grounds of unpatentability in accordance with the above-stated principles.

*D. Anticipation of Claims 1 and 10 by Eiben*

With respect to the alleged ground of unpatentability based on anticipation by Eiben, we have reviewed the Petition, the Patent Owner

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Response, and Petitioner's Reply, as well as the relevant evidence discussed in each of those papers. We are persuaded, by a preponderance of the evidence, that claims 1 and 10 are anticipated by Eiben under 35 U.S.C. § 102(b).

*1. Overview of Eiben (Ex. 1003)*

Eiben describes a dust collector that filters dirty air through a plurality of vertically oriented filter bags 18 contained in filtering compartments 10, 12, 14, 16. Ex. 1003, 2:42–45. Air is drawn through the walls of bags 18 in each compartment 10, 12, 14, 16 and through exhaust ductwork 30 from the side of each compartment 10, 12, 14, 16 to clean air pipe 36 through valve mechanism 32. *Id.* at 2:60–68. Figures 1 and 3, below, are side views of the dust collecting apparatus of Eiben.

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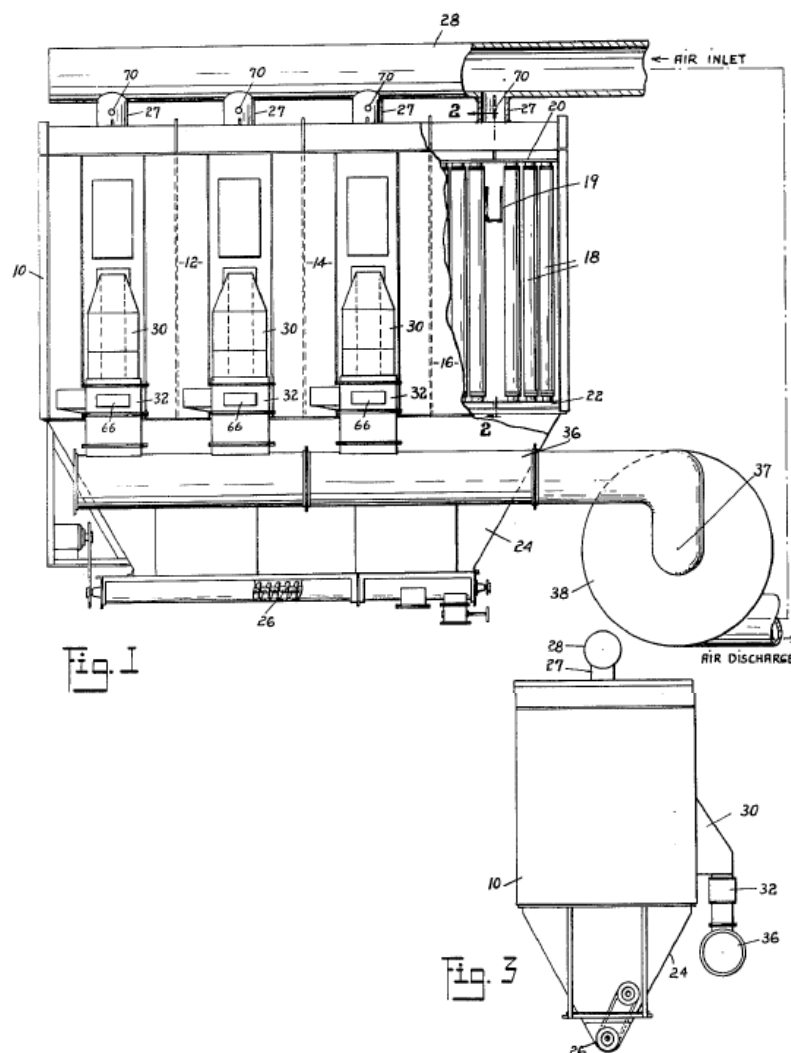


Figure 3 is a side view taken from a left-hand end of Figure 1.

When it is desired to clean filter bags 18 in a particular compartment or chamber of the device, air reversal valve 32 is actuated, which moves baffle plate 60 to a closed position and opens door 66 to admit atmospheric or reverse air to flow through bags 18 in a compartment. That actuation causes bags 18 to collapse, thereby loosening dust on the inner surfaces of bags 18 and aiding in the removal of trapped dust from bags 18. *Id.* at 4:35–56. Figure 6 below is a sectional view of the air reversal valve.

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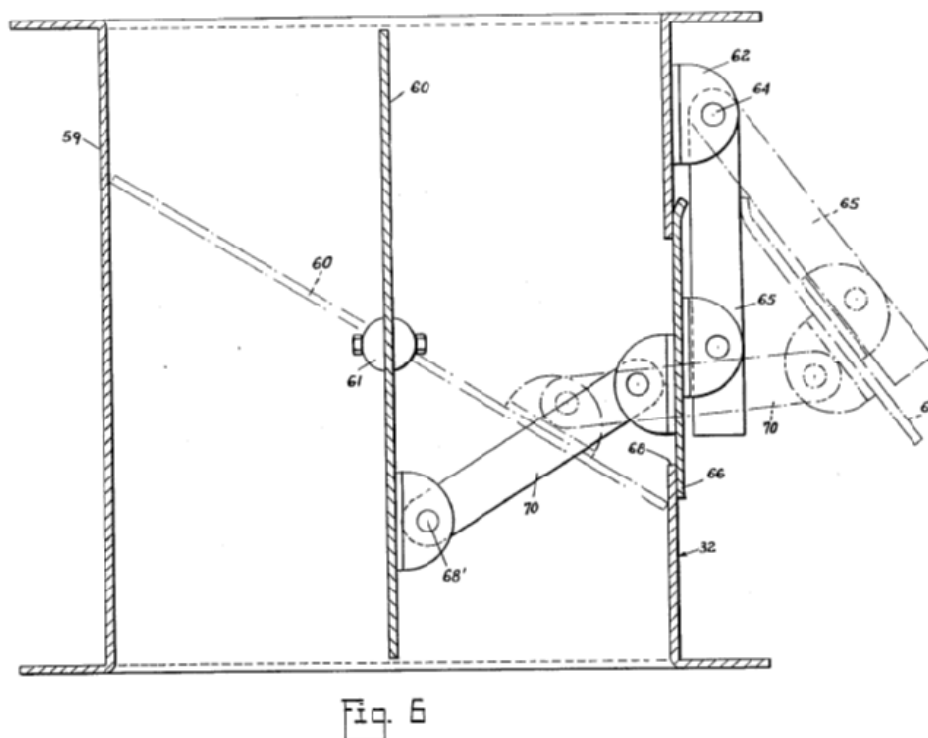


Figure 6 illustrates the completely closed position of baffle plate 60 in dot-dash outline of the structure, while the normal open position of baffle plate 60 is the vertical position. *Id.* at 4:21–24.

## 2. Comparison of Eiben and Claims 1 and 10

Concerning the elements of independent claims 1 and 10, we agree with Petitioner's identification of every claim limitation in Eiben's disclosure of a vacuum cleaning machine. Pet. 26–36. The claimed canister corresponds to “compartment units 10, 12, 14, and 16 [that] are assembled together and mounted atop a hopper 24.” *Id.* at 26 (citing Ex. 1003, 2:42–68). Referring to Figure 1, the canister has inlet port 28, and four outlet ports 30 are also shown (encompassing “at least two outlet ports” recited in claim 1 and “three outlet ports” recited in claim 10). *Id.* (citing Ex. 1003, Fig. 1, 2:60–68, 4:25–35). The “at least two filters” recited in claim 1 and

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“three filters” recited in claim 10 are shown inside of the canister, where each filter is a set of filter bags 18 in each compartment 10, 12, 14, and 16. *Id.* (citing Ex. 1003, Fig. 1, 2:44–45, 3:10–66). Each filter (set of filter bags 18) is in pneumatic communication through a corresponding one of each outlet port 30. *Id.* at 26–27 (citing Ex. 1003, 2:60–68, 4:25–35). There is vacuum source 38 and valve 32 for each compartment unit 10, 12, 14, 16 disposed outside of the canister, thus “at least two valves” and “three valves” as recited in claims 1 and 10, respectively. *Id.* at 27 (citing Ex. 1003, Figs. 1, 3–6, 2:60–68, 3:67–4:24, 4:35–43). Each valve 32 is in pneumatic communication between vacuum source 38 and a corresponding one of each outlet ports 30 and each valve permits air to be drawn by the vacuum source from inlet port 28 simultaneously through corresponding ones of the filters (one filter is a set of filter bags 18). *Id.* at 27 (citing Ex. 1003, Figs. 1, 3–6, 2:60–65, 3:67–4:35). The valve in its open position is connected to the vacuum source and, in its closed position, air inlet door 66 is open to permit ambient air to enter while plate 60 “seals off the exhaust duct 36 from the interior of the associated collecting unit or chamber.” *Id.* at 27–28 (quoting Ex. 1003, 4:14–15).

Eiben has a “means for sequentially operating” the valve because “the drawings depict a motor unit 50’ for operating each valve 32, [and] the specification also discloses that each valve 32 may instead be operated by an ‘electric solenoid.’” *Id.* at 28 (citing Ex. 1003, 3:69–73). Specifically, the “means for sequentially operating” operates valves 32 to switch the filters (one filter is a set of filter bags 18) from connection to vacuum source 38 to connection to ambient air (via air inlet door 66) and permits ambient air to be drawn through corresponding valves and filters to create a reverse flow

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for cleaning the filter. *Id.* at 27–28 (citing Ex. 1003, Fig. 6, 3:67–4:24, 4:35–49).

Patent Owner challenges the evidence of anticipation of claims 1 and 10 by Eiben by arguing that the canister in Eiben is either (1) an isolated compartment 10, 12, 14, 16, in which case the canister only has inlet port 27 and single outlet port 30 and does not meet the claim limitation “a cannister having . . . at least two outlet ports” or (2) the canister is collectively compartments 10, 12, 14, 16, in which case the canister has multiple inlet ports 27 and multiple outlet ports 30 and does not meet the claim limitation “a cannister having an inlet port.” PO Resp. 18–24.

Patent Owner also argues that Eiben’s vacuum cleaning machine does not anticipate the challenged claims because dirty air is on the inside of the filter in Eiben’s machine, rather than the outside of the filter as depicted in the ’640 patent. *Id.* at 24–27. Stated another way, Patent Owner argues that its arrangement of filters in its canister partitions the dirty air/clean air on the outside/inside of the filter, respectively, whereas Eiben’s arrangement partitions the dirty air/clean air on the inside/outside of the filter, respectively. *Id.* at 5–17 (citing Ex. 1001; Ex. 1003; Ex. 2005; Ex. 2006).

We find Patent Owner’s arguments unpersuasive because the ’640 patent claims are sufficiently broad so as to encompass the distinctions drawn between the figures in the ’640 patent and Eiben. While claims 1 and 10 read on Patent Owner’s embodiment shown in Figures 1–5, the claims also read on Eiben’s embodiment shown in Figures 1 and 3–6. *See* Ex. 1001, 3:28–4:56 (describing the vacuum shown in Figure 1); Ex. 1003, 3:67–4:57 (describing the vacuum shown in Figures 1, 3–6). Based on the evidence presented, we find nothing in the claim language that precludes

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Eiben’s “compartment units 10, 12, 14, and 16 [that] are assembled together and mounted atop a hopper 24,” from being a canister with inlet port 28 and at least two outlet ports 30 as required by claims 1 and 10. Pet. 26; *id.* at 29–31. Claims 1 and 10 both signal an open-ended structure with the transition term “comprising,” allowing for (1) the inclusion of walls or compartments within the canister, including a hopper compartment at the bottom, and (2) inlet port 28 to include ducts 27.

Similarly, we find nothing in claims 1 and 10 that precludes a bag filter as used in Eiben, because the claims do not recite a dirty air/clean air arrangement relative to the outside/inside of the filters. Patent Owner’s arguments regarding the ’640 patent having the dirty air/clean air on the outside/inside of the filters are not tied to claim limitations. *See* PO Resp. 18–27; Pet. Reply 6–8. Claims 1 and 10 merely require that air be drawn “through” the filters. Ex. 1001, 8:13, 17, 9:2, 5. Eiben describes air passing through the walls of its filter bags. Ex. 1003, 4:30–31 (“the air passes transversely through the bags’ walls”), 4:48 (“reverse air flow through the bags”). Therefore, the type of filter used in the ’640 patent is not a patentable difference over Eiben.

Patent Owner’s further distinctions, based on Eiben’s filters not being “connected” to the valves, vacuum source, or exhaust ducts, also are not tied to claim limitations because we do not construe “pneumatic communication” as requiring any particular structure or duct to connect these components. *See supra*; PO Resp. 19 (“arrangement of parts and resulting flow patterns are not at all the same”), 22 (“Patent Owner’s vacuum source 15 is connected through valves 31, 32, 33 to corresponding filters 21, 22, 23”), 23 (“Eiben’s valves 32 are not connected between the filter bags 18 and the

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blower 38”), 24 (Eiben’s filters are “not connected to their corresponding exhaust ducts 30”).

Patent Owner’s diagrams in Exhibits 2005 and 2006 do not illustrate any patentable distinctions over the ’640 patent claims for the additional reason that Patent Owner depicts Eiben’s compartment units 10, 12, 14, and 16 as individual canisters rather than assembled together as shown in Figure 1 of Eiben and argued by Petitioner. Based on the preponderance of the evidence, Eiben’s canister is “compartment units 10, 12, 14, and 16 [that] are assembled together and mounted atop a hopper 24,” where the canister has an inlet port (28) and at least two outlet ports (30). Pet. 26; *id.* at 29–31; Ex. 1003, Figs. 1, 3.

In sum, the preponderance of the evidence on the complete record after trial shows that Eiben’s dust collecting apparatus with reverse air flow operation anticipates claims 1 and 10 for the reasons provided by Petitioner. Pet. 26–36; Pet. Reply 1–16.

*E. Obviousness of Claims 1, 4–6, 10, and 13–18*

Regarding claims 1 and 10, Petitioner asserts that, to the extent that the term “means for sequentially operating” also requires timing features from a controller, rather than just the solenoids controlled by the controller as described in the ’640 patent embodiments, Wellan’s controller is equivalent to the structure in the ’640 patent’s electronic embodiment. Pet. 37–38. Petitioner’s rationale for combining Wellan’s controller with Eiben’s electronic solenoid operated valves is based on Eiben already disclosing the functional language of the “means for sequentially operating,” because “its solenoids or other actuators are triggered to switch each valve 32 individually to permit the reverse flow of ambient air to enter its filter



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compartment and backflush the filter therein.” *Id.* at 38. Petitioner contends that Wellan, like Eiben, teaches the use of a controller to actuate solenoids in a vacuum cleaning machine, similar to Eiben’s, that has a dusty air section containing a plurality of filter bags that are backflushed with air. *Id.* According to Petitioner, Wellan’s electronic controller includes a timer that has inputs for adjusting the frequency and length of time at which a stepping switch moves between connections to the various individual solenoids for valves 38. *Id.* at 39–40 (citing Ex. 1004, Fig. 7, 5:52–60, 7:42–47, 7:58–61). Wellan characterizes such controllers as “more-or-less conventional” and therefore, Petitioner argues, the use of Wellan’s controller to electronically control the timing of the valves in Eiben’s vacuum machine would be the “predictable use of prior art elements according to their established functions” rendering the claims obvious. *Id.* at 41 (quoting *KSR Int’l Inc. v. Teleflex, Inc.*, 550 U.S. 398, 417 (2007)).

Regarding claims 4–6 and 13–15, Petitioner asserts that the electronic controller of Wellan is equivalent to the electronic controller of the ’640 patent, and that Wellan’s electronic controller sets the intermittent time that the valve is switched to ambient air in the same manner as the backflush timer 103 in the ’640 patent. *Id.* at 42–43 (citing Ex. 1001, 6:40–50, 7:1–6; Ex. 1004, 5:52–59, 7:42–47). Similarly, Petitioner asserts that Wellan’s electronic controller is equivalent to the controller of the ’640 patent, because both controllers turn the solenoid valves on and off individually, and, therefore, set a cycle time of periods when the solenoids are energized (on) and de-energized (off). *Id.* at 44–46 (citing Ex. 1001, 6:8–11, 6:17–33; Ex. 1004, 5:55–59). Accordingly, Petitioner asserts that the combination of Wellan’s controller with Eiben’s device meets the “means for setting said

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intermittent time” recited in claims 5, 6, 14, and 15 and the “means for setting a cycle time” recited in claims 4, 6, 13, and 15. *Id.* at 42–43, 44–46.

Patent Owner argues in response that the combination of Eiben with any of the secondary references cited by Petitioner is improper because “Eiben’s dust collecting apparatus is a bag house with separate compartments 10, 12, 14, 16, each large enough to contain an operator walkway 19, as is shown by Eiben in Figure 1” and

[a] person of ordinary skill in the art of portable vacuums would not combine bag house art collecting dirt inside of compartmentalized filters with art relied upon for its valve control systems to arrive at the structure and air flow paths of a portable, single canister, backflush vacuum cleaner.

PO Resp. 28, 29. Patent Owner also contends that the combination of Eiben and Wellan “is moot in view of Eiben’s failure to disclose each and every element of claims 1 and 10 for which Petitioner relies on Eiben.” *Id.* at 29.

For the reasons provided in the Petition and above, we are persuaded that Eiben discloses the elements recited in claims 1 and 10. Based on the trial record, claims 1 and 10 encompass a backflush vacuum cleaner with bag house filters in a canister. We do not read into the claims any specific structures from a particular embodiment appearing in the specification of the ’640 patent where the claim language is broader than the embodiment. *See Van Geuns*, 988 F.2d at 1184 (“limitations are not to be read into the claims from the specification”). Nor do we find claims 1 and 10 to be limited in size to “a portable, single canister, backflush vacuum cleaner” as asserted by Patent Owner in its Response. Patent Owner acknowledged at the oral hearing that size was not a patentable distinction over the prior art. *See Tr.* 42:12–18. Petitioner has shown by a preponderance of the evidence that Eiben describes the use of electronic solenoids, such as those disclosed in

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Wellan, for sequentially operating valves in vacuum cleaning devices. Petitioner also has shown adequately how the controller in Wellan is equivalent to the controller in the '640 patent to meet the “means for setting a cycle time” and the “means for setting said intermittent time” limitations required by dependent claims 4–6 and 13–15. Therefore, the preponderance of the evidence demonstrates that substituting the controller in Eiben’s device with Wellan’s controller would have been obvious as a predictable variation in the same field. Accordingly, we are persuaded, by a preponderance of the evidence, that claims 1, 4–6, and 13–15 would have been obvious in view of Eiben and Wellan for the reasons provided by Petitioner and the reasons articulated herein. *See* Pet. 37–47; Pet. Reply 1–19.

*F. Obviousness of Claims 7–9 and 16–18*

After considering Petitioner’s and Patent Owner’s positions as to claims 7–9 and 16–18, as well as their supporting evidence, we determine that Petitioner has shown by a preponderance of the evidence that those claims are unpatentable under 35 U.S.C. § 103(a) as obvious over the combination of Eiben, DE219, and Howeth, and, for claims 9 and 18, further in view of Wellan.

Petitioner asserts that DE219 teaches a piston reciprocally disposed between two ports, as required by claims 7 and 16, and that such a valve is interchangeable with other valve arrangements, including the flap valve type taught by Eiben. Pet. 49–50 (citing Ex. 1008, Figs. 1, 2, ¶¶ 16, 20–45). Petitioner asserts that the valve arrangement in DE219 includes rods that move linearly back and forth under the control of electromagnets, as in a solenoid. *Id.* Petitioner asserts further that the recited “means biasing said

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piston” to simultaneously (1) close one of said two ports and (2) open another of said two ports,<sup>5</sup> corresponds to a spring in the ’640 patent. Petitioner asserts additionally that Howeth teaches such a spring in the context of an ambient air backflushed vacuum device. *Id.* at 50–51 (citing Ex. 1007, Figs. 9, 10, 13:39–16:37, 14:14). Regarding claims 8 and 17, which depend from claims 1 and 16, respectively, Petitioner asserts that the required “means for overcoming said bias” corresponds to a solenoid for each valve in the ’640 patent, and that a solenoid is present in Eiben. *Id.* at 51.

Claims 9 and 18 depend from claims 8 and 17, respectively, and require “said bias overcoming means comprising at least two solenoids, one corresponding to each said valve, and means for energizing said solenoids to switch said valves to connect said filters to ambient air and for de-energizing said solenoids to switch said valves to connect said filters to said vacuum source.” Petitioner cites portions of Eiben, which apply electricity to actuate its electrical solenoids, as corresponding to these claim limitations. *Id.* at 52. To the extent that the claims require an actual switch to actuate each solenoid, Petitioner further asserts that Wellan teaches that such switches for energizing and de-energizing solenoids would have been predictable and obvious in a vacuum device. *Id.* at 53 (citing Ex. 1004, Fig. 7; Ex. 1013 ¶¶ 25, 36–37).

Patent Owner argues that Petitioner’s obviousness challenges over the combination of Eiben, DE219, and Howeth (and further in view of Wellan)

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<sup>5</sup> We understand Petitioner to refer to this means-plus-function term recited in claims 7 and 16 when it refers to “means for biasing” on page 50 of the Petition.

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all are moot because Eiben does not disclose every element of claims 1 and 10 for the reasons discussed above. PO Resp. 30–31. Patent Owner also asserts that the combination of Eiben with any of the cited secondary references is improper because Eiben relates to “bag house art” rather than “a portable, single canister, backflush vacuum cleaner.” *Id.* at 29. We determine that Patent Owner’s arguments are misplaced because a proper analogous arts comparison is between the claimed invention and the prior art reference, and not between prior art references. Using that standard, we determine that Patent Owner’s assertions are unpersuasive because the field of the claimed invention relates generally to “vacuum cleaning equipment,” which we find is in the same field as Eiben’s “devices known as dust collectors” (Ex. 1001, 1:9–11), and in any case, Eiben discloses each of the elements of independent claims 1 and 10 as discussed above.<sup>6</sup>

Based on the trial record, we are persuaded that the combination of DE219, Howeth, and Wellan teach the interchangeability with a flap valve of a piston reciprocally disposed between two ports, and the known, predictable use of a spring for biasing a piston and a switch for energizing and de-energizing an electrical solenoid. We also are persuaded that use of the combination of an alternate valve arrangement and alternate solenoid is nothing “more than the predictable use of prior art elements according to their established functions.” *KSR*, 550 U.S. at 417. Therefore, for the reasons provided in the Petition and for the reasons articulated herein, claims

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<sup>6</sup> We find that DE219 (“[t]he invention relates to a vacuum cleaner” Ex. 1008 ¶ 1) and Howeth (“timing actuator adapted for use in conjunction with a pneumatic cleaning system for impingement type dust collector/filter units” (Ex. 1007, 1:23-26)) are each analogous art to the claimed invention.

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7–9 and 16–18 would have been obvious over Eiben, DE219, and Howeth. *See* Pet. 49–53; Pet. Reply 1–19. For the same reasons, we also are persuaded that the preponderance of the evidence demonstrates that claims 9 and 18 would have been obvious over Eiben, DE219, and Howeth in further view of Wellan. *See* Pet. 53; Pet. Reply 1–19.

### III. CONCLUSION

Petitioner has demonstrated by a preponderance of the evidence that (1) claims 1 and 10 are anticipated by Eiben, (2) claims 1, 4–6, 10, and 13–15 would have been obvious over Eiben and Wellan; (3) claims 7–9 and 16–18 would have been obvious over Eiben, DE219, and Howeth; and (4) claims 9 and 18 would have been obvious over Eiben, DE219, Howeth, and Wellan. This is a final written decision of the Board under 35 U.S.C. § 318(a). Parties to the proceeding seeking judicial review of this Decision must comply with the notice and service requirements of 37 C.F.R. § 90.2.

### IV. ORDER

Accordingly, it is hereby:

ORDERED that, as set forth in Section III above, claims 1, 4–10, and 13–18 of the '640 patent have been shown to be unpatentable.

FURTHER ORDERED that the parties to the proceeding seeking judicial review of this Final Written Decision must comply with the notice and service requirements of 37 C.F.R. § 90.2.

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PETITIONER:

Jack S. Barufka

Bryan P. Collins

PILLSBURY WINTHROP SHAW PITTMAN LLP

[Jack.barufka@pillsburylaw.com](mailto:Jack.barufka@pillsburylaw.com)

[Brian.collins@pillsburylaw.com](mailto:Brian.collins@pillsburylaw.com)

[docket\\_ip@pillsburylaw.com](mailto:docket_ip@pillsburylaw.com)

PATENT OWNER:

Frank J. Catalano

Paul E. Rossler

GABLE & GOTWALS, P.C.

[iplaw@gablelaw.com](mailto:iplaw@gablelaw.com)

[prossler@gablelaw.com](mailto:prossler@gablelaw.com)



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(12) **United States Patent  
McCutchen**(10) **Patent No.: US 7,082,640 B2**(45) **Date of Patent: Aug. 1, 2006**(54) **AMBIENT AIR BACKFLUSHED FILTER  
VACUUM**(75) Inventor: **David L. McCutchen**, Sand Springs,  
OK (US)(73) Assignee: **Christy, Inc.**, Sand Springs, OK (US)(\*) Notice: Subject to any disclaimer, the term of this  
patent is extended or adjusted under 35  
U.S.C. 154(b) by 52 days.(21) Appl. No.: **10/623,356**(22) Filed: **Jul. 18, 2003**(65) **Prior Publication Data**

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(51) **Int. Cl.****A47L 9/20** (2006.01)**B01D 45/18** (2006.01)**B01D 46/04** (2006.01)(52) **U.S. Cl.** ..... **15/352**; 55/302; 55/283;  
55/284(58) **Field of Classification Search** ..... 15/327.1,  
15/327.2, 327.6, 347, 352, 353; 55/283,  
55/284, 287, 288, 302, 385.1, 484, DIG. 3;  
95/278–280; 96/425–428

See application file for complete search history.

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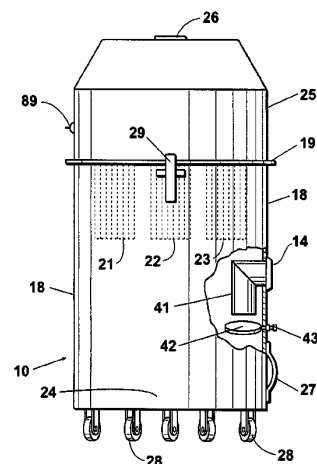
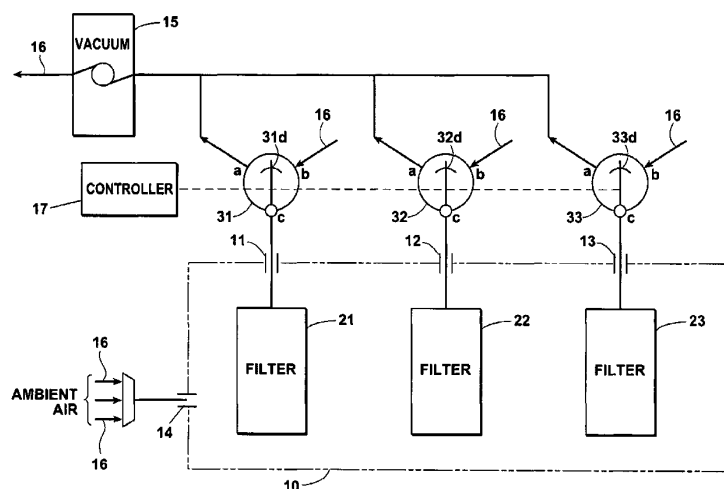
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*Primary Examiner*—Terrence R. Till(74) *Attorney, Agent, or Firm*—Frank J. Catalano(57) **ABSTRACT**

A vacuum cleaning machine has a cannister with an inlet port and at least two outlet ports. At least two filters are disposed inside of the cannister, one in pneumatic communication through each of the outlet ports. At least two valves are disposed outside of the cannister. Each valve is in pneumatic communication between a vacuum source and an outlet port so as to permit air to be drawn by the vacuum source from the inlet port simultaneously through the filters. A controller operates the valves to switch the filters from the vacuum source to ambient air so as to permit ambient air to be sequentially intermittently drawn through corresponding valves and filters into the cannister. Preferably, the controller includes a timing mechanism for setting the delay time of the sequential valve operation and a timing mechanism for setting the intermittent time of connection of each filter to ambient air.

**20 Claims, 6 Drawing Sheets**



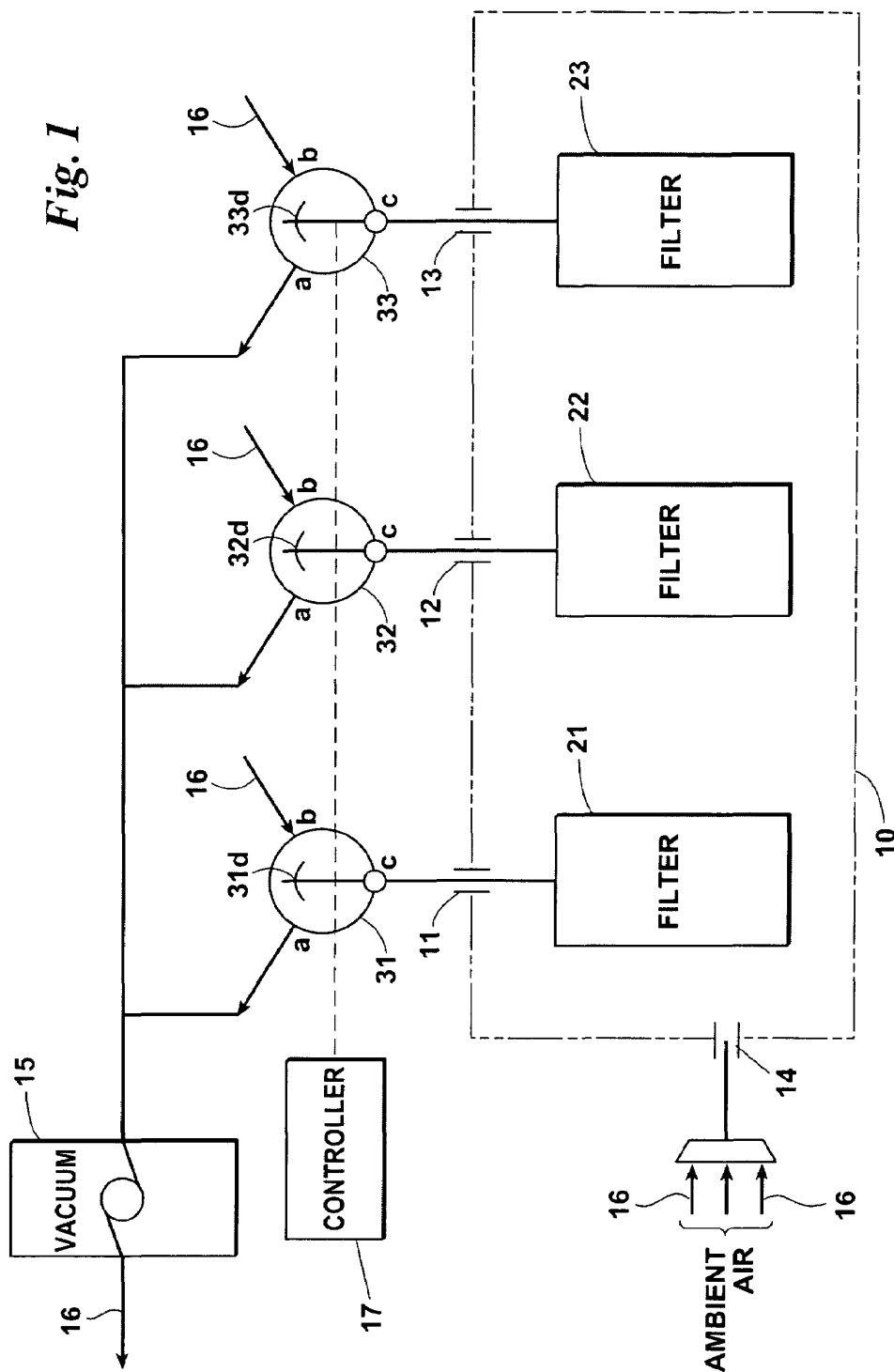
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Fig. 1



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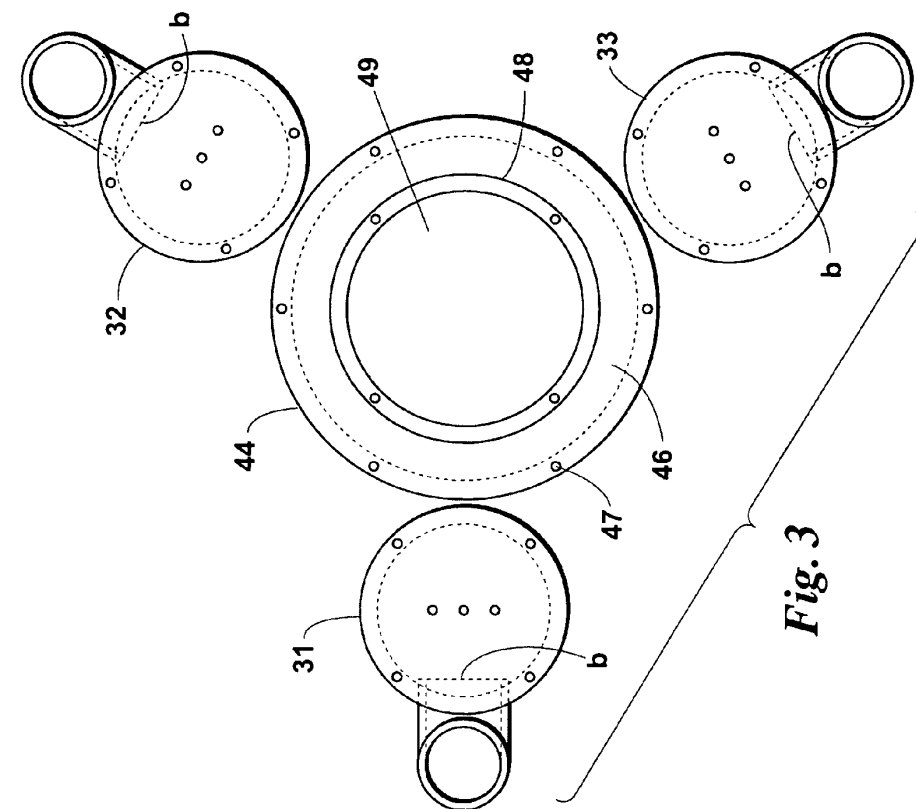


Fig. 3

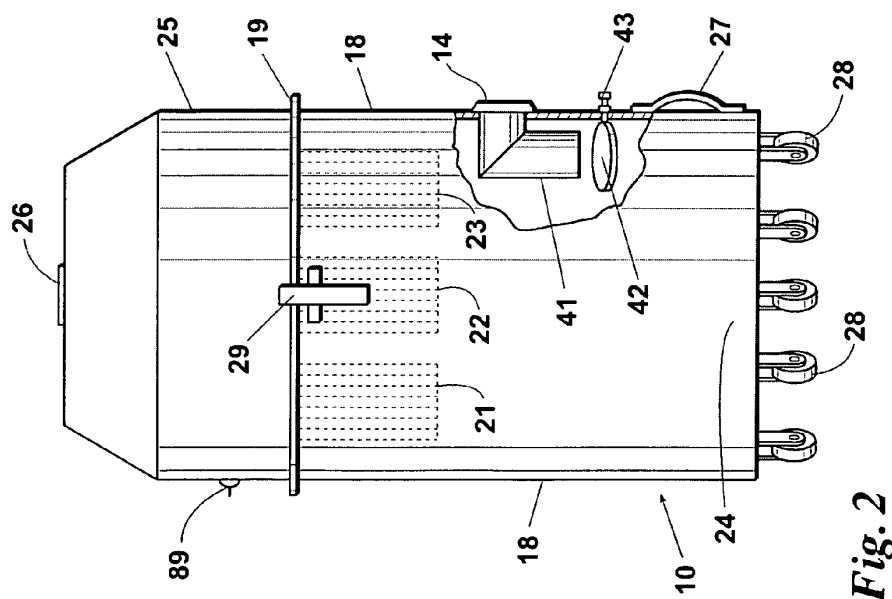


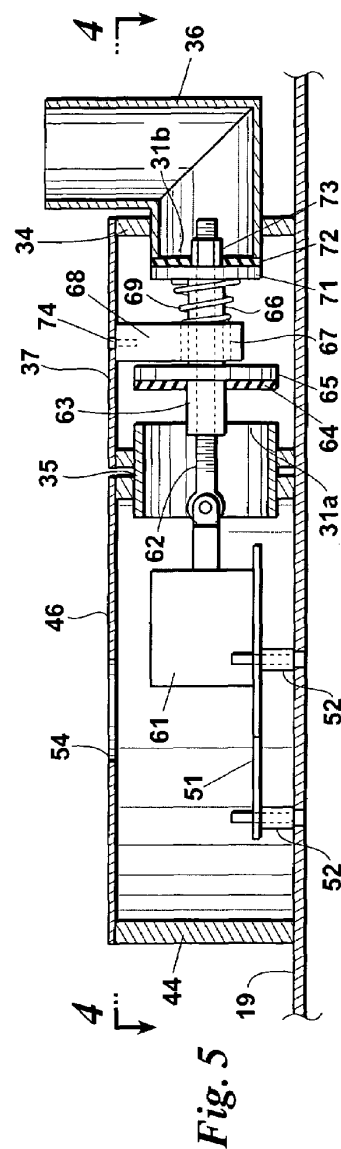
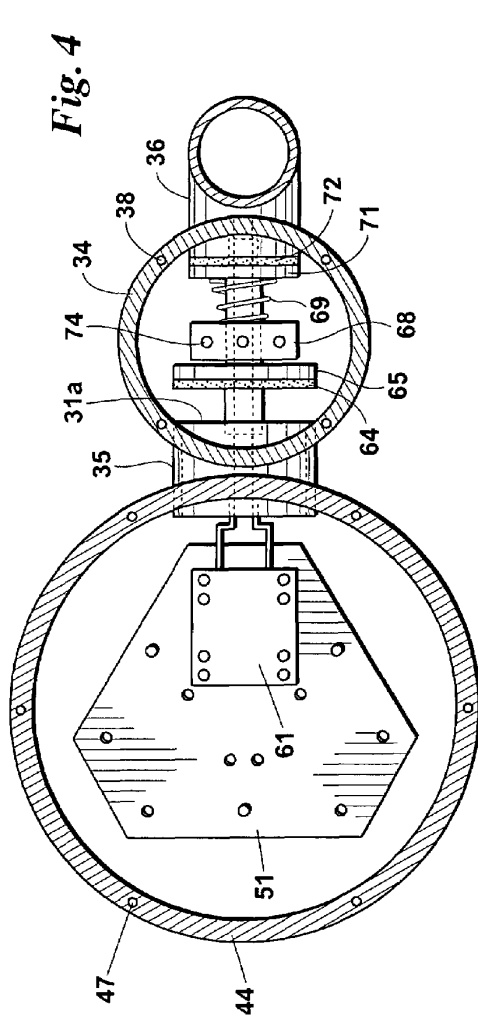
Fig. 2

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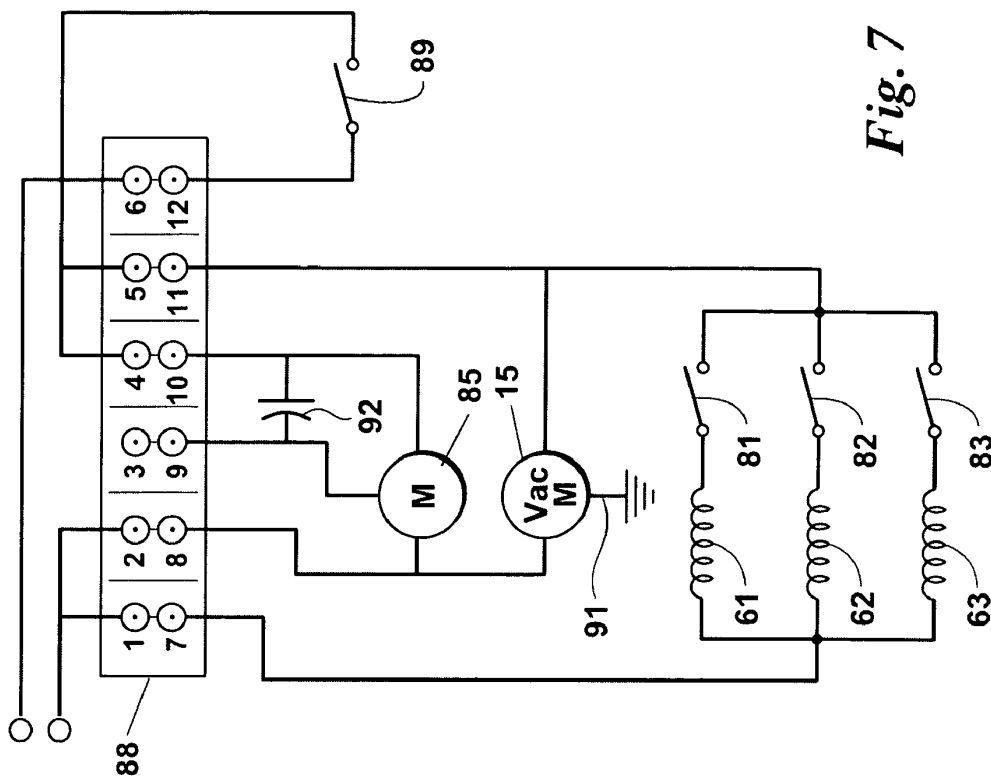


Fig. 7

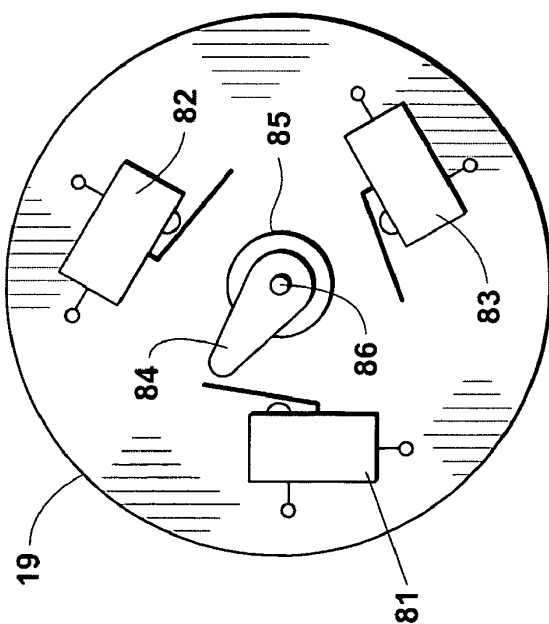


Fig. 6

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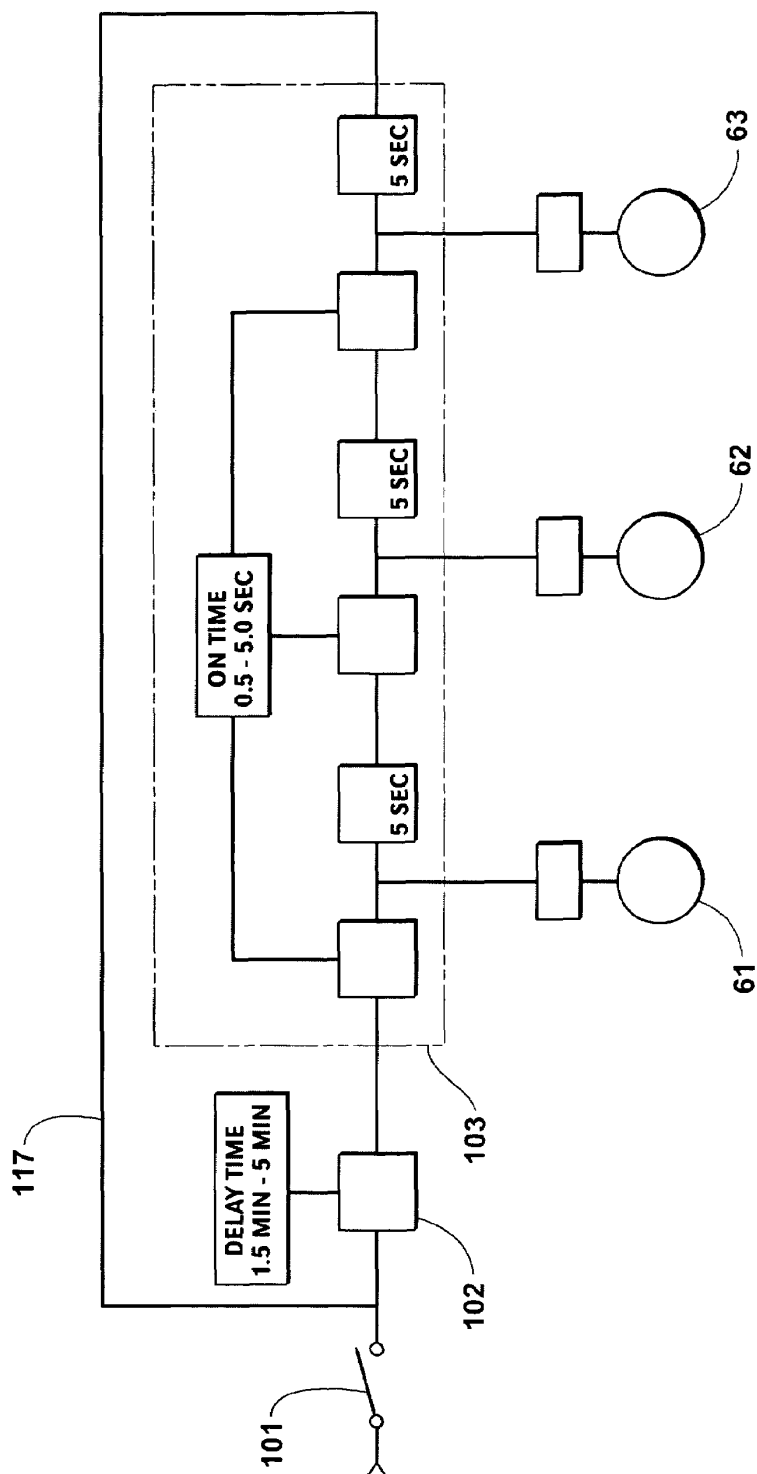


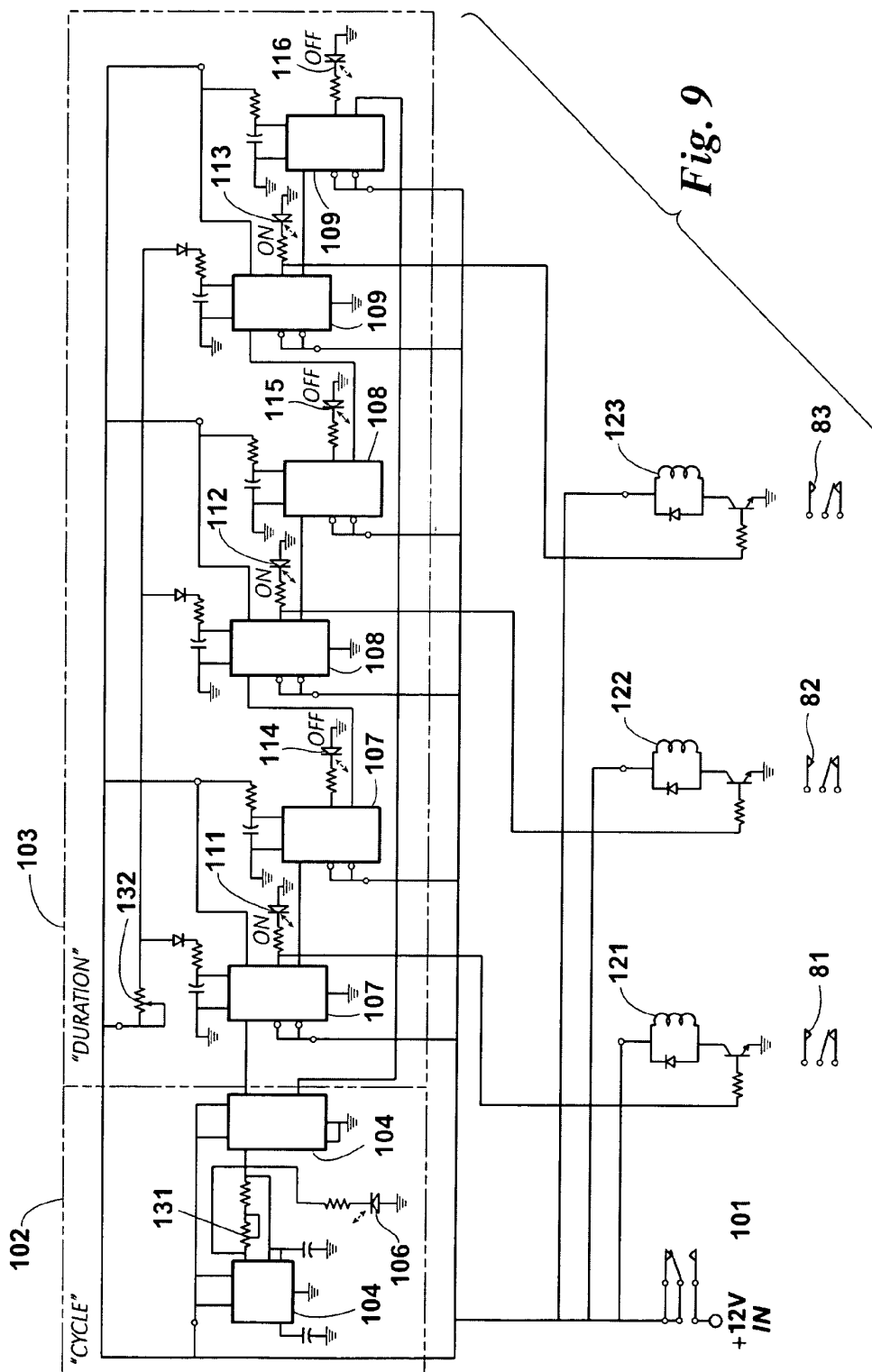
Fig. 8

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**AMBIENT AIR BACKFLUSHED FILTER  
VACUUM****BACKGROUND OF THE INVENTION**

This invention relates generally to vacuum cleaning equipment and more particularly concerns a vacuum cleaner having filters backflushed with ambient air.

Cleaning filtered vacuums is presently accomplished by shaker, percussion, forced air or compressed air systems. Such systems periodically apply mechanical or pneumatic forces to dislodge particles collected on the intake surfaces of the filters. To accomplish this, a force system other than the primary vacuum system is required, such as a second blower motor, a compressor or a shaker or percussion system motor. These added components make backflushed vacuums considerably more expensive and more readily subject to malfunction.

Except for very expensive complex 240 volt systems, these systems are mechanically controlled. Therefore, they have limited flexibility in their operating parameters. While their cycle time can be varied, perhaps by changing the rotational speed of a cam, the fractional relationship of the backflush time to full cycle time can only be changed by an exchange of mechanical components, such as the cam drive motor. The efficiency of the backflush cycle, however, is dependent on the proper coordination of the cycle and backflush times to the characteristics of the particular medium being vacuumed. For example, a short burst of backflushed air will clean dust collected on a filter, but a longer burst is necessary to dislodge particles of plastic or fibers.

These problems are exacerbated because these systems generally exhibit considerable turbulence within the collecting cannister, and as a result the same particles are often continuously recycled, unnecessarily overloading the backflush system.

It is, therefore, an object of this invention to provide a backflushed filter vacuum which uses ambient air to backflush the filters. Another object of this invention is to provide a backflushed filter vacuum which does not require use of a secondary shaker, percussion, forced air or compressed air system. A further object of this invention is to provide a backflushed filter vacuum which can be controlled by an electronic system economically compatible with a relatively inexpensive 120 volt machine. Yet another object of this invention is to provide a backflushed filter vacuum which permits independent control of both cycle and backflush time. It is also an object of this invention to provide a backflushed filter vacuum which permits cycle and backflush times to be varied relative to each other without interchanging mechanical components. Still another object of this invention is to provide a backflushed filter vacuum which permits the user to adjust cycle and backflush times to suit the medium being vacuumed. An additional object of this invention is to provide a backflushed filter vacuum which reduces the likelihood of recycling particles through the filters.

**SUMMARY OF THE INVENTION**

In accordance with the invention, a vacuum cleaning machine has a cannister with an inlet port and at least two outlet ports. At least two filters are disposed inside of the cannister, one in pneumatic communication through a corresponding one of each of the outlet ports. At least two valves are disposed outside of the cannister. Each valve is in

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pneumatic communication between a vacuum source and a corresponding outlet port so as to permit air to be drawn by the vacuum source from the inlet port simultaneously through the filters. A controller operates the valves to switch the filters from connection to the vacuum source to connection to ambient air so as to permit ambient air to be sequentially intermittently drawn through corresponding valves and filters into the cannister. Preferably, the controller includes a timing mechanism for setting the delay time between cycles of the sequential valve operation and a timing mechanism for setting the intermittent time of connection of each filter to ambient air.

The preferred valve has a housing with a continuously opened port and two reciprocally opened and closed ports. A piston disposed between the two ports is biased to a first position in which one of the two ports is closed and the other of the two ports is opened. A mechanism for overcoming the bias moves the piston to a second position in which the closed port is opened and the opened port is closed. The preferred bias overcoming mechanism is a solenoid with a switch. The continuously opened port is in pneumatic communication with the filter. One of the two reciprocal ports is in pneumatic communication with the vacuum source and the other with ambient air. When the solenoid is energized, the valve connects its filter to ambient air. When the solenoid is de-energized, the valve connects its filter to the vacuum source.

In a specially preferred embodiment, the vacuum cleaning machine has a cannister with an opening in its top and an inlet port. A plate closes the opening. The plate has three outlet ports. Three filters are mounted on the plate and disposed inside of the cannister, one in pneumatic communication through a corresponding one of each of the outlet ports. A vacuum source and three valves are also mounted on the plate outside of the cannister. Each valve has a first port in continuously opened pneumatic communication with a corresponding outlet port, a second port in pneumatic communication with the vacuum source and a third port in pneumatic communication with a source of ambient air. A piston reciprocally disposed between the second and third ports is biased by a coil spring to simultaneously close the third port and open the second port in a vacuum mode. A solenoid overcoming the bias reciprocates the piston to simultaneously close the second port and open the third port in a backflush mode. The controller causes the valves to sequentially switch the filters from communication with the vacuum source to communication with ambient air for a preset time. The controller is preferably configured to allow the operator to set the cycle time of the sequential valve operation and also to set the intermittent time of connection of the filters to ambient air.

Preferably, the cannister also contains a mechanism cooperable with the inlet port to divide the cannister into an upper zone of high velocity vortex air flow and a lower zone of reduced velocity air flow so as to reduce the likelihood of recycling particles through the filters. This can be achieved by positioning the inlet port below the filters and above the bottom of the cannister using a duct to redirect air flow downwardly in the cannister from the inlet port and using a baffle to redirect the downward flow to a circumferential flow.

**BRIEF DESCRIPTION OF THE DRAWINGS**

Other objects and advantages of the invention will become apparent upon reading the following detailed description and upon reference to the drawings in which:

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FIG. 1 is a block diagram of the ambient air backflushed filter vacuum;

FIG. 2 is a side elevation of the ambient air backflushed filter vacuum;

FIG. 3 is a top plan view of the backflushed filter vacuum pneumatics;

FIG. 4 is a top plan view of a typical valve of the backflushed filter vacuum;

FIG. 5 is a side elevation view of the valve of FIG. 4;

FIG. 6 is a plan view of an electro-mechanical control system for the backflushed filter vacuum valves;

FIG. 7 is a schematic electrical diagram of the electro-mechanical system of FIG. 6;

FIG. 8 is a block diagram of an electronic control system for the backflushed filter vacuum valves; and

FIG. 9 is a schematic diagram of the electronic control system of FIG. 8.

While the invention will be described in connection with a preferred embodiment, it will be understood that it is not intended to limit the invention to that embodiment. On the contrary, it is intended to cover all alternatives, modifications and equivalents as may be included within the spirit and scope of the invention as defined by the appended claims.

#### DETAILED DESCRIPTION

Turning first to FIG. 1, the ambient air backflushed filter vacuum generally includes a cannister 10 with three outlet ports 11, 12 and 13 and an inlet port 14. Three filters 21, 22 and 23 are disposed within the cannister 10 and three valves 31, 32 and 33 are disposed outside of the cannister 10. Each of the valves 31, 32 and 33 has a continuously opened port 31c, 32c or 33c which is in constant communication through a respective outlet port 11, 12 or 13 with a respective filter 21, 22 or 23. Each valve 31, 32 and 33 also has two reciprocally opened and closed ports 31a and 31b, 32a and 32b and 33a and 33b, respectively, and an operating mechanism 31d, 32d and 33d, respectively, for switching the valves 31, 32 and 33 between their reciprocal ports "a" and "b". One reciprocal port "a" of each of the valves 31, 32 and 33 is connected to a vacuum source 15 and the other reciprocal port "b" of each of the valves 31, 32 and 33 is in pneumatic communication with a source of ambient air 16. A controller 17 causes the operating mechanisms 31d, 32d and 33d to sequentially operate to switch the filters 21, 22 and 23 from pneumatic communication with the vacuum source 15 to pneumatic communication with ambient air 16. Each of the valves 31, 32 and 33 is normally connected so that the vacuum source 15 draws ambient air 16 through the cannister inlet port 14 into the cannister 10 and through the walls of the filters 21, 22 and 23. The controller 17 then sequentially causes the valves 31, 32 and 33 to switch to the ambient air port "b". When, for example, one valve 31 is in this backflushed mode through its ambient air port "b", the other valves 32 and 33 continue in the vacuum mode through their respective vacuum ports "a". The suction through the filters 22 and 23 draws ambient air 16 through the valve port 31 "b" and into the filter 21, reversing the flow of air through the filter 21 and causing particles that have collected on the outer wall of filter 21 to be dislodged to drop to the bottom of the cannister 10. After a brief, predetermined backflush time, the controller 17 will cause the first valve 31 to return to its vacuum port "a" so as to resume the vacuum mode through all three filters 21, 22 and 23. After another predetermined time lapse, the controller 17 will sequentially perform the same operation on a second valve 32, so that the

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other valves 31 and 33 cause the second filter 22 to be backflushed. When the second filter 22 has been backflushed for the predetermined time period and the delay time has elapsed, the controller 17 will then cause the same operation to occur with respect to the third filter 23. The cycle continues for as long as the vacuum source 15 is in operation. When the third filter 23 has been backflushed, the controller 17 will delay for a predetermined time period before reinitiating the cycle. Preferably, and as hereinafter explained, the controller 17 is configured so as to allow the user to select both the delay time and the backflush time for the system.

Turning now to FIG. 2, the structural configuration of the cannister 10 is illustrated. The cannister 10 is a cylindrical container having side walls 18, a bottom 24 and an open top. The open top is covered by a circular plate 19. The filters 21, 22 and 23 are mounted to the bottom of the plate 19 and pneumatically communicate through the outlet ports 11, 12 and 13 in the plate 19. The inlet port 14 to the cannister 10 extends through its side wall 18, as shown at a point below the bottom of the filters 21, 22 and 23 and above the bottom 24 of the cannister. The valves 31, 32 and 33, the operating mechanisms 31d, 32d and 33d, the controller 17 and the vacuum source 15 are mounted above the plate 19 and are protected by a cover 25 which is seated on the plate 19. An opening 26 is provided in the cover 25 to exhaust air discharged from the vacuum source 15. A handle 27 is provided proximate the bottom of the cannister 10 to facilitate lifting and handling of the unit. Casters 28 at the bottom 24 of the cannister 10 allow the cannister 10 to be freely rolled in any direction. Latches 29 permit removal of the cover 25 and the plate 19 from the cannister 10 to allow access to the interior of the cannister 10 and the filters 21, 22 and 23.

Continuing to look at FIG. 2, an assembly for maximizing the efficiency of airflow within the cannister 10 during use is also seen. A duct 41 is provided inside the cannister 10 to redirect air flow through the inlet port 14 downwardly and proximate the side wall 18 of the cannister 10. The inlet port 14 can be above the bottom level of the filters 21, 22 and 23 as long as the duct 41 extends below the filters 21, 22 and 23. A baffle 42 is positioned within the cannister 10 slightly below the outlet end of the duct 41. The baffle 42 is sized to provide a barrier to the path of air flow from the duct 41. As shown, the baffle 42 is secured to the cannister wall 18 by an external bolt 43 which can be loosened to permit changing the angle of inclination of the baffle 42 from horizontal. The baffle 42 redirects the air flow into a circular vortex above the baffle 42. Below the baffle 42, air flow velocities are considerably reduced and there is little turbulence. As a result, when particles filtered by the filters 21, 22 and 23 are backflushed from the filters 21, 22 and 23, the particles settle to the bottom 24 of the cannister 10 and are far less likely to be recycled through the filters 21, 22 and 23. It has been found that a baffle angle of 10 degrees from horizontal works effectively, though this angle may be varied considerably.

Turning now to FIG. 3, a preferred embodiment of the valves 31, 32 and 33 and their operating mechanisms is illustrated. A central housing 44 is preferably concentrically located on top of the circular plate 19 covering the cannister 10. The central housing 44 may be fixed to the plate 19 by screws 45 and a plate 46 covering the central housing 44 is also fastened to the housing 44 by screws 47. A concentric motor mount spacer 48 is fastened to the top of the central housing cover plate 46 and extends upwardly to and supports the mount 49 for the vacuum source 15. The valves 31, 32 and 33 are concentrically disposed about the central

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housing 44, preferably displaced at equal angles. Thus, as shown, for the three valve configuration, the valves 31, 32 and 33 are at 120 degree intervals about the center of the central housing 44.

The configuration of each of the valves 31, 32 and 33 is shown in FIGS. 4 and 5 and is explained in relation to one of the valves 31. The other valves 32 and 33 are in all respects identical to the valve 31 now described. A mounting plate 51 is fixed to the cannister plate 19 at an elevation determined by standoffs 52. The valve 31 is formed by a cylindrical housing 34 also fastened to the cannister plate 19 by screws. The central housing 46 is connected to the valve housing 34 by a radial duct 45. The ambient air port 31b is radially aligned with the duct 35 which forms the vacuum port 31a for the valve 31. The ambient air duct 36 extends from the ambient air port 31b into the source of ambient air 16. The valve housing 34 is completed by a cover 37 fastened to the top of the housing 34 by screws 38.

The operating mechanism 31d for the valve 31, shown generally in FIG. 1, is also shown in greater detail in FIGS. 4 and 5. A solenoid 61 is mounted on a plate 51 with the solenoid shaft 62 aligned on the radius extending through the central axis of the ducts 35 and 36. The remainder of the operating mechanism 31d is best understood in relation to the manner in which it is assembled. The solenoid shaft 62 has a threaded portion on which is threaded a bolt 63. A gasket 64 and valve plate 65 slide over the shaft 62 with the plate 65 against the bolt 63 and the bolt 63 seated in a hole in the gasket 64. The gasket 64 and plate 65 are configured to cover the vacuum port 31a of the valve 31. A sleeve 66 slides over the shaft 62 against the valve plate 65. An integral bushing 67 and bracket 68 slide over the sleeve 66 and a spring 69 slides over the sleeve 66 and against the bushing 67. A second valve plate 71 and gasket 72 slide onto the shaft 62 and against the sleeve 66. A nut 73 is tightened onto the threaded end of the shaft 62 and seats in a hole in the gasket 72 against the second plate 71. The second valve plate 71 and gasket 72 are configured so as to cover the ambient air port 31b of the valve 31. The valve plates 65 and 71 taken together form a piston of a length determined by the length of the sleeve 66. The bracket 68 is fastened to the valve cover 37 by screws 74. The travel of the piston is therefore determined by the spacing of the vacuum port 31a and the ambient air port 31b. The solenoid 61 and the spring 69 are coordinated so the spring 69 exerts 2.3 psi against the second valve plate 71 in its preloaded condition and can be fully compressed at 4 psi. The spring 69 normally holds the ambient air port 31b closed and the vacuum air port 31a opened. When the solenoid 61 is energized, its pull overcomes the spring 69 to shift the piston to close the vacuum port 31a and open the ambient air port 31b of the valve 31.

As seen in FIG. 4, additional solenoids can be mounted at 120 degree intervals on the solenoid mounting plate 51 to serve the remaining valves illustrated in FIG. 3. Coordinated selection of the solenoid 61, the spring 69, the diameter of the valve housing 34 and the length of the piston defined by the valve plates 65 and 71 and the sleeve 66 in the above described assembly procedure automatically establishes the piston travel distances and preloads the appropriate spring compression. Upon energizing the solenoid 61, the bias of the spring 69 is overcome and the solenoid 61 quickly pulls the piston to close the vacuum port 31a and open the ambient air port 31b of the valve 31. A central opening 54 in the cover plate 46 in the central housing 44 allows pneumatic communication through the cylindrical spacer 48 to the vacuum source 15. All of the housing and duct

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components are sealed at their connections to assure the pneumatic integrity of the system.

Turning now to FIGS. 6 and 7, an electro-mechanical embodiment of the controller 17 is illustrated. In this embodiment solenoids 61, 62 and 63 are controlled by switches 81, 82 and 83, respectively, which are operated by a cam 84 driven by a geared cam motor 85 connected to the cam 84 by a drive shaft 86. The cycle time for operation of the switches 81, 82 and 83 by the cam 84 is not adjustable without a change of structural components, such as selection of a motor with a different rpm. The components of the controller 17 are connected as illustrated through a terminal block 88. The vacuum source 15 and main power on/off switch 89 are also connected via the terminal block 88. The vacuum motor 15 is grounded 91 and the cam motor 85 is provided with a capacitor 92 to assist in operation of the motor 85. When the machine main power switch 89 is turned on, the vacuum motor 15 and cam motor 85 are both energized. As long as the switches 81, 82 and 83 remain open, the solenoids 61, 62 and 63 remain de-energized and all of the filters 21, 22 and 23 are connected to the vacuum source 15 through the valve vacuum ports 31a, 32a and 33a. As the cam 84 rotates to engage the next of the switches 81, 82 or 83 in its path, the solenoids 61, 62 and 63 are sequentially energized to close their respective vacuum ports 31a, 32a and 33a and to open their ambient air ports 31b, 32b or 33b, respectively, so as to connect their respective filters 21, 22 or 23 to ambient air 16. The filter 21, 22 or 23 will be backflushed for as long as their associated solenoids 61, 62 or 63 remain energized, a period determined by the relation of the cam 84 to the contact elements of the switches 81, 82 or 83. As shown in FIG. 6, the controller 17 and its components are mounted on the cannister plate 19.

Turning now to FIGS. 8 and 9, an electronic embodiment of the controller 17 is illustrated. In this embodiment, when the system main power switch is turned on, the controller power switch 101 is also turned on. The controller consists essentially of two timers 102 and 103. The first timer 102 establishes the delay time between activation of the solenoids 61, 62 and 63. The second timer 103 establishes the "on" time for each of the solenoids 61, 62 and 63 and an "off" time before the next solenoid 61, 62 or 63 is energized. The use of this embodiment has the added advantage of allowing the user by means of the first timer 102 to select the delay time between sequential operations of the solenoids 61, 62 and 63. The user is also permitted through the second timer 103 to select the "on" time, as shown from 0.5 to 5.0 seconds, for each of the solenoids 61, 62 and 63 so that each filter 21, 22 and 23 will receive one burst of backflushing ambient air for the selected backflush time interval. The time between solenoid operations is also set by the backflush timer 103 and may be, but as shown is not, variable by the user. As shown, an "off" time of 5 seconds is selected. This can be set at any value by the manufacturer. Assuming for example, an "off" time of 0.5 seconds, the delay timer 102 being set for 3 minutes and the backflush timer 103 being set for 10 seconds, the total cycle time will be 3 minutes 45 seconds. That is, every 3 minutes and 45 seconds, each filter 21, 22 and 23 will be backflushed once.

As seen in FIG. 9, when power is applied, the delay timer 102 starts. The delay time can be set from 1.5 to 5 minutes by the operator with a screw driver adjusted potentiometer 131 or some other type device. When the delay timer 102 times out, it starts the backflush timer 103. The second timer 103 operates the control relays 121, 122 and 123 which actuate the switches 81, 82 and 83 to pick up the solenoids 61, 62 and 63. Each solenoid 61, 62 and 63 is energized

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sequentially during the cycle. The duration "on" time for each solenoid **61**, **62** and **63** is adjustable from 0.5 seconds to 5 seconds with an operator controlled screw driver adjusted potentiometer **132** or some other device. Duration "on" time is the same for all solenoids **61**, **62** and **63** once set. At the end of the cycle, the delay timer **102** is reinitiated. This cycling continues until power is turned off. Preferably, the delay timer **102** employs a single dual pressure monostable multi-vibrator **104** with a variable resistor **131** to permit delay time adjustment by the user. An LED **106** is provided as confirmation of operation of the delay timer **102**. The backflush timer **103** employs three such multi-vibrator chips **107**, **108** and **109** in a cascaded configuration with LED's **111**, **112** and **113** and **114**, **115** and **116**, respectively, to indicate the ON/OFF condition of each of the control relays **121**, **122** and **123** which, in turn, pick up the switches **81**, **82** and **83** for their respective solenoids **61**, **62** and **63**.

A prototype of the ambient air backflushed filter vacuum was satisfactorily tested with the following components:

Element	Component	Description
10	cannister	18 1/4" I.D. x 22" H 16 gauge carbonate steel
15	vacuum source	2-stage 110 volt AC 115 cfm vacuum motor
19	plate	19 1/4" diameter 10-gauge galvanized cold rolled sheet metal
21, 22, 23	filters	99.8% at 0.2 micron cartridge filters
25	cover	20" diameter x 11" H ABS plastic
34	valve housings	3" diameter schedule 40 PVC plastic
35	ducts	2" diameter schedule 40 PVC plastic
36	ducts	1 1/2" diameter schedule 40 PVC plastic
44	central housing	6" diameter schedule 40 PVC plastic
48	spacer	4" diameter schedule 40 PVC plastic
61, 62, 63	solenoids	110 volt AC/pull rate of 4# at 0.5" stroke
64	gaskets	closed cell PVC foam
65	valve plates	16 gauge cold rolled sheet metal
66	sleeves	1/4" diameter x 1 1/4" aluminum spacers
67/68	bushing/bracket	HMHD polypropylene/high impact plastic
69	spring	conical compression spring/1 1/4" compressed to 3/4" at 2.3 psi and fully compressed at 4 psi
85	cam motor	4 rpm geared AC motor
104	multi-vibrator	555/4541
107, 108, 109	multi-vibrator	4538

While the machine has been described in relation to a three filter system, the machine could employ any number of filters and associated valve, solenoid and switch combinations provided that at least two such combinations are employed so that at least one combination will always provide suction from the vacuum source **15**. The valves **31**, **32** and **33** may employ hinged covers or other mechanisms than pistons. The valve operating mechanisms **31d**, **32d** and **33d** may be structurally different as long as the vacuum ports "a" and ambient air ports "b" are closed at pressures not defeated by the suction of the vacuum source **15** but within the bias overcoming force of the solenoids **61**, **62** and **63**.

Thus, it is apparent that there has been provided, in accordance with the invention, an ambient air backflushed filter vacuum that fully satisfies the objects, aims and advantages set forth above. While the invention has been described in conjunction with a specific embodiment thereof, it is evident that many alternatives, modifications and variations will be apparent to those skilled in the art and in light of the foregoing description. Accordingly, it is

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intended to embrace all such alternatives, modifications and variations as fall within the spirit of the appended claims.

What is claimed is:

1. A vacuum cleaning machine comprising a cannister having an inlet port and at least two outlet ports, at least two filters disposed inside of said cannister, one in pneumatic communication through a corresponding one of each of said outlet ports, a vacuum source, at least two valves disposed outside of said cannister, each said valve being in pneumatic communication between said vacuum source and a corresponding one of each of said outlet ports and permitting air to be drawn by said vacuum source from said inlet port simultaneously through corresponding ones of said filters and means for sequentially operating said valves to switch said filters from connection to said vacuum source to connection to ambient air and permitting ambient air to be drawn through corresponding ones of said valves and said filters which are connected to ambient air by said vacuum via corresponding ones of said valves and filters which are connected to said vacuum.

2. A vacuum cleaning machine according to claim 1 further comprising means cooperable with said inlet port to divide said cannister into an upper zone of high velocity vortex air flow and a lower zone of reduced velocity air flow.

3. A vacuum cleaning machine according to claim 2, said inlet port being disposed below said filter and above a bottom of said cannister and said cooperable means comprising a duct directing air flow downwardly in said cannister from said inlet port and a baffle redirecting said downward flow to a circumferential flow.

4. A vacuum cleaning machine according to claim 1, said operating means having means for setting a cycle time of said sequential valve operation.

5. A vacuum cleaning machine according to claim 1, said operating means having means for setting said intermittent time of connection to ambient air for each said filter.

6. A vacuum cleaning machine according to claim 1, said operating means having means for setting a cycle time of said sequential valve operation and means for setting said intermittent time of connection to ambient air for each said filter.

7. A vacuum cleaning machine according to claim 1, each said valve comprising a housing having a continuously open port and two reciprocally opened and closed ports there-through, a piston reciprocally disposed between said two ports and means biasing said piston to simultaneously close one of said two ports and open another of said two ports.

8. A vacuum cleaning machine according to claim 7, said operating means further comprising means for overcoming said bias to move said piston to simultaneously open said one of said two ports and close said another of said two ports.

9. A vacuum cleaning machine according to claim 8, said bias overcoming means comprising at least two solenoids, one corresponding to each said valve, and means for energizing said solenoids to switch said valves to connect said filters to ambient air and for de-energizing said solenoids to switch said valves to connect said filters to said vacuum source.

10. A vacuum cleaning machine comprising a cannister having an inlet port and three outlet ports, three filters disposed inside of said cannister, one in pneumatic communication through a corresponding one of each of said outlet ports, a vacuum source, three valves disposed outside of said cannister, each said valve being in pneumatic communication between said vacuum source and a corresponding one of each of said outlet ports and permitting air to be drawn by

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said vacuum source from said inlet port simultaneously through corresponding ones of said filters and means for sequentially operating said valves to switch said filters from connection to said vacuum source to connection to ambient air whereby ambient air is drawn sequentially through corresponding ones of said valves and said filters which are connected to ambient air by said vacuum via corresponding ones of said valves and filters which are connected to said vacuum.

11. A vacuum cleaning machine according to claim 10 further comprising means cooperable with said inlet port to divide said cannister into an upper zone of high velocity vortex air flow and a lower zone of reduced velocity air flow.

12. A vacuum cleaning machine according to claim 11, said inlet port being disposed below said filter and above a bottom of said cannister and said cooperable means comprising a duct directing air flow downwardly in said cannister from said inlet port and a baffle redirecting said downward flow to a circumferential flow.

13. A vacuum cleaning machine according to claim 10, said operating means having means for setting a cycle time of said sequential valve operation.

14. A vacuum cleaning machine according to claim 10, said operating means having means for setting said intermittent time of connection to ambient air for each said filter.

15. A vacuum cleaning machine according to claim 10, said operating means having means for setting a cycle time of said sequential valve operation and means for setting said intermittent time of connection to ambient air for each said filter.

16. A vacuum cleaning machine according to claim 10, each said valve comprising a housing having a continuously open port and two reciprocally opened and closed ports therethrough, a piston reciprocally disposed between said two ports and means biasing said piston to simultaneously close one of said two ports and open another of said two ports.

17. A vacuum cleaning machine according to claim 16, said operating means further comprising means for over-

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coming said bias to move said piston to simultaneously open said one of said two ports and close said another of said two ports.

18. A vacuum cleaning machine according to claim 17, said bias overcoming means comprising at least two solenoids, one corresponding to each said valve, and means for energizing said solenoids to switch said valves to connect said filters to ambient air and for de-energizing said solenoids to switch said valves to connect said filters to said vacuum source.

19. A vacuum cleaning machine comprising a cannister having an opening in a top thereof and an inlet port, a plate closing said opening, said plate having three outlet ports, three filters mounted on said plate and disposed inside of said cannister, one in pneumatic communication through a corresponding one of each of said outlet ports, a vacuum source, three valves mounted on said plate and disposed outside of said cannister, each said valve having a first port in continuously open pneumatic communication with a corresponding one of said outlet ports, a second port in pneumatic communication with said vacuum source and a third port in pneumatic communication with a source of ambient air, a piston reciprocally disposed between said second and third ports, a coil spring biasing said piston to simultaneously close said third port and open said second port in a vacuum mode and a solenoid for overcoming said bias and reciprocating said piston to simultaneously close said second port and open said third port in a backflush mode and means for operating said valves to sequentially switch said filter from communication with said vacuum source to communication with ambient air for a preset time.

20. A vacuum cleaning machine according to claim 19, said operating means having means for setting a cycle time of said sequential valve operation and means for setting an intermittent time of connection to ambient air for said filters.

\* \* \* \* \*

**United States Court of Appeals  
for the Federal Circuit**

*Christy, Inc. v. Black & Decker (U.S.), Inc.*, 2016-2498, -2499

**CERTIFICATE OF SERVICE**

I, Robyn Cocho, being duly sworn according to law and being over the age of 18, upon my oath depose and say that:

Counsel Press was retained by GABLEGOTWALS, counsel for Appellant to print this document. I am an employee of Counsel Press.

On **November 28, 2016** counsel has authorized me to electronically file the foregoing **Brief for Appellant Christy, Inc.** with the Clerk of Court using the CM/ECF System, which will serve via e-mail notice of such filing to all counsel registered as CM/ECF users, including the following principal counsel for the parties:

Bryan Patrick Collins  
Pillsbury Winthrop Shaw Pittman LLP  
1650 Tysons Boulevard, 14th Floor  
McLean, VA 22102  
703-770-7538  
bryan.collins@pillsburylaw.com

Paper copies will also be mailed to the above principal counsel at the time paper copies are sent to the Court.

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November 28, 2016

/s/ Robyn Cocho  
Counsel Press

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/s/ Amelia A. Fogleman  
Name: Amelia A. Fogleman

*Counsel for Appellant  
Christy, Inc.*